Simulation-based training for learning neurosurgical instruments: iPad vs VR

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Division of Neurosurgery
Disclaimer

I am on the Medical Advisory Board of Conquer Experience
Research Objectives

To determine whether PeriopSim™ training improves instrument recognition in both VR and iPad simulations.

To determine whether PeriopSim™ training in VR vs iPad differs in residents’ learning real surgical instruments.

To assess residents’ experience and satisfaction using VR vs iPad simulations.
Methods

PGY-1 Neurosurgery Residents

VR Group
N=18
PeriopSim Instrument Trainer x3
Real instrument tray

iPad Group
N=19
PeriopSim Instrument Trainer x3
Real instrument tray

2017 & 2018
Statistical Analysis

- ANOVA with three factors of Measure (Total Score, Accuracy, Time Saved) and a between factor of Group (VR vs iPad)

- Independent Sample t-tests for real instrument recognition score and time
Results

Simulation: Total Score

<table>
<thead>
<tr>
<th>Session</th>
<th>VR</th>
<th>iPAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results

Simulation: Errors

<table>
<thead>
<tr>
<th></th>
<th>VR</th>
<th>iPad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>Session 2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Session 3</td>
<td>0.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>
Results

Real Instruments: Knowledge Transfer

Accuracy & Time

Accuracy (%)

Time (sec)

Accuracy

Average Time

Group

VR

iPad

0 10 20 30 40 50 60 70 80 90 100

0 5 10 15 20 25 30 35 40 45

Orange: Accuracy

Blue: Average Time
Conclusion

VR and iPad environments are equally successful for PGY1 residents learning real instruments

But... were the instruments too easy?
So, study repeated (Sample 2) using a more difficult set of instruments
Results

Simulation: Total Score

Average Total Score

<table>
<thead>
<tr>
<th>Session</th>
<th>iPad</th>
<th>VR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2500</td>
<td>1800</td>
</tr>
<tr>
<td>2</td>
<td>3500</td>
<td>2200</td>
</tr>
<tr>
<td>3</td>
<td>4000</td>
<td>2500</td>
</tr>
</tbody>
</table>
Results

Simulation: Average Errors

Average Errors

<table>
<thead>
<tr>
<th>Session</th>
<th>iPad</th>
<th>VR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.5 ± 1.2</td>
<td>5.0 ± 1.0</td>
</tr>
<tr>
<td>2</td>
<td>2.0 ± 0.5</td>
<td>3.0 ± 0.7</td>
</tr>
<tr>
<td>3</td>
<td>2.5 ± 0.8</td>
<td>2.5 ± 0.8</td>
</tr>
</tbody>
</table>

p<0.001
Results

Simulation: Time Saved

Average Time Saved

<table>
<thead>
<tr>
<th>Session</th>
<th>iPad</th>
<th>VR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Real Instruments: Knowledge Transfer

Accuracy & Time

Group

VR

iPad

Accuracy (%)

80

Accuracy

Average Time

Time (sec)

0

10

20

30

40

0

100

80

60

40

20
How easy was it to use the technology?

**iPAD**
- moderately easy
- very easy
- extremely easy

**VR**
- moderately easy
- very easy
- extremely easy
Did the simulation help you to learn instruments?

**iPAD**

**VR**

- disagree
- agree
- strongly agree
How likely would you be to use this app in the future?

- iPAD
- VR

- Slightly likely
- Moderately likely
- Very likely
- Extremely likely
Overall Conclusions

• Similar performance in recognizing instruments in PeriopSim™ instrument trainer for VR and iPad

• iPad and VR simulated environments are equally effective in learning real instruments

• PGY1 neurosurgery residents view the use of both iPad and VR simulation for learning surgical instruments as positive platforms and as effective learning tools
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