Voxel –Man TempoSurg Virtual Reality Simulator (VRS) - a face validity study

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Introduction

The Voxel Man Simulator is a 3D Virtual reality otology simulator which aims to replicate the complex 3 dimensional temporal bone anatomy. Virtual reality Simulation allows the acquisition and replication of surgical skills in a safe environment and is particularly useful in areas with complex anatomy such as the temporal bone 1

Aims/Objectives

- To assess the face validity of
  - the Voxel –Man TempoSurg VR Simulator (VRS)
  - Questionnaire based on a likert scale designed to rate
- Anatomic appearance
- Drill appearance
- Haptic feedback
- Usefulness as a teaching/training aid
- User friendliness
- Overall global rating

Methods

- Nine ENT Surgeons
- Specialty trainees and career middle grades
- One hour supervised training session by senior author
- Asked to complete Questionnaire rating their experience
- Immediately after using the simulator
- Rating was on a 5 part likert scale ranging from;
  1 – poor to 5 - very good

Results

- For simplicity we combined the results from the Likert Scale into 3 broader categories as follows:
  - Poor - ratings 1 and 2
  - Neither good nor poor - rating 3
  - Good / very good - rating 4 and 5
- 8/9 Surgeons rated VRS as good/v. good for :
  - Appearance of anatomy
  - Haptic feedback
  - Overall graphics
  - Useful tool in learning surgical anatomy and surgical approach
  - 1/9 was unhappy with the haptic feedback
- Almost all rated it good / v. good for:
  - Appearance of drill
  - Learning how to use drill
  - Hand eye co-ordination
  - User friendliness of the equipment
- All trainees felt they would benefit from having the simulator as an integral part of their training.

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<thead>
<tr>
<th>Appearance of Anatomy</th>
<th>Haptic Feedback</th>
<th>Overall Graphics</th>
<th>Useful tool in learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>1</td>
<td>0</td>
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<tr>
<td>Neither Good or Poor</td>
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<td>0</td>
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<tr>
<td>Good / Very Good</td>
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<td>8</td>
<td>9</td>
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</table>

<table>
<thead>
<tr>
<th>Appearance of Drill</th>
<th>Learning how to use Drill</th>
<th>Hand Eye coordination</th>
<th>User friendliness of equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>0</td>
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Discussion

The VM VRS technology has recently been introduced as a significant new approach to training for the temporal bone. Temporal bone simulation has traditionally been undertaken using cadaveric temporal bones. However there are drawbacks with using cadaveric materials including limited availability, ethical limitations, absence of pathology, expense, and eventual disposal 2. Additionally each temporal bone represents an isolated opportunity to dissect the temporal bone. The VM simulator is a free standing small portable unit with 2 haptic feedback devices and 3-D visuals (Fig 1 and 2). It is designed as a training tool to aid the development and training of surgeons and not as a replacement for the temporal bone 3. Although the cost may be considered a disadvantage, there are many advantages including repeatability, having access at any time, the potential to save the dissection on the system which can then be reviewed either together with a tutor or later by the tutor themselves, understanding the 3-D anatomy and being able to upload CT scans to the system which can then be dissected on the simulator.

Conclusion

Initial results show that the majority of users found the Voxel Man Otology Simulator to be a useful training tool for the temporal bone Surgery. These results continue to contribute to the face validity of the Voxel Man Otology Simulator

References