"Usefulness perception of dentists, academics and students of the VirTeaSy haptic virtual reality simulator in dental education"

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**Local Context**

**Concepción City, Bio-Bio Region, Chile**

- The Great Concepción area, is a metropolitan area located in the south-central Chile, consists of ten communes, with a little over a million people, located in the Bio-Bio region.

- Famous for it’s Earthquakes and tsunamis, which razed the town in 1570, 1657, 1687, 1730 and 1751, led the authorities to move the town to its current site.

**Superior Education: (Colleges and Universities)**

- 6 Dental Schools
- 4 Traditional Universities
- 10 Private Universities
- 12 Professional Institutes

**Ongoing Research**

Objectives:

- Validate the use of the HVR Simulator as a tool for teaching in Dentistry.
- Incorporate the use of the HVR Simulator to preclinical, clinical and post-graduate programs with a stronger scientific background.

**Exercises:**

- 4 Familiarization (Blocks, Cross, Key 1 and 2)
- 29 Conservative (Caries removal, Black's Class 1 and 2 Cavities; and Sista's Cavity preparations in anterior and posterior teeth)
- 4 Root Canal Treatment (Access cavity preparation for anterior and posterior teeth)

**MECESUP**

**Mecesup Proyect: Curricular Articulation and Innovation of the Teaching Learning Process**

- Improvement of Quality, Equity and relevance in Chilean Higher Education
- Financing coordinated by the Chilean government, that encourages and facilitates higher levels of excellence in Chilean higher education (External: The World Bank input: Euros $250.000 aprox.)
- 5 VirtEasy haptic virtual reality simulators for 3 different University headquarters, in use 2016.
Theoretical Framework

**HVRS Haptic Arm Study Exercise Sample Size Conclusions**

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<tbody>
<tr>
<td>Periure</td>
<td>Not Specified</td>
<td>Students Performance, &amp; other criteria [13]</td>
<td>Cavity Preparation</td>
<td>60</td>
<td>Effective training method. Significantly improved post nauseous performance</td>
</tr>
<tr>
<td>Ongoing</td>
<td>Not Specified</td>
<td>Students Performance, &amp; other criteria [13]</td>
<td>Technical assessment &amp; training</td>
<td>30</td>
<td>Technical exercise real for teeth, not gingival may aid in developing dental skills and potential self training</td>
</tr>
</tbody>
</table>

**Ongoing Research**

**Incorporation of a haptic virtual reality simulator in Oral Implantology Post-Graduated Program Curriculum**

**Juan Fonseca M. & Marcelo Fernández S.**

*Universidad San Sebastián, Concepción Headquarters, Chile*

**Objectives:**

- Provide an environment for learning implantology
- Improve its assessment and proficiency
- Determine the training time necessary in the HVR Simulator for the new post-graduated implantology curriculum

**Addressed to:**
- First year students of the oral implantology post-graduated program at San Sebastian University, Concepción Headquarters, Chile.

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**3 Prosthodontics (Crown Preparations: Full metal, metal/ceramic and full ceramic)**

**12 Implantology** (Treatment planning on CT Scan before implant insertion with expert \*image not visible* for single tooth, partial and total edentulism and preclinical exercises)

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**“VirTeaSy Implant Pro”**

**Characteristics**

- **Prosthodontics (Crown Preparations: Full metal, metal/ceramic and full ceramic)**
- **Implantology** (Treatment planning on CT Scan before implant insertion with expert \*image not visible* for single tooth, partial and total edentulism and preclinical exercises)
Incorporation of a haptic virtual reality simulator in Oral Implantology Post-Graduated Program Curriculum

**Methodology:**
- Students must practice the preclinical exercises on the VirTeaSy HVR Simulator until they are familiarized with the equipment. (Familiarization exercises)
- Must perform the following procedures 8 times corresponding to the virtual "expert" planning furnished by the simulator.
  - 2 exercises:
    - a. 1 Single Gap implant placement (3.5)
    - b. 2 Partial Edentulism implant placement (4.4 & 4.5)


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"Usefulness perception of dentists, academics and students of the VirTeaSy haptic virtual reality simulator in dental education"

**Objective:**
- Determine the perception of dental students, dental practitioners and academics from schools of dentistry on the usefulness of haptic simulators in the training of dental students

**Methodology:**
- Before the first contact with the haptic simulators each participant received oral supervised and standardized basic instructions, including the study objectives.
- Each participant will practice on the Cross Preclinical Exercise for 5 to 10 min; then they perform a Black’s class 2 cavity in a Virtual Reality Environment in the HVR Simulator (20 min top).
- A 12 question questionnaire was build from Steinberg’s publication (2) and mainly by Gal’s [1] work; beside other general information (Age, years of and working experience), also regarding to their experience with 3D technology and gaming. Participants have the chance to voluntarily write down any free comments about their experience.

**Sample:**
- 127 participants up to July 2016. Distributed in the following way:
  - 60% 4th, 5th and 6th year students
  - 10% Dental Practitioners
  - 30% Dentist who are Academics or Faculty in Dental Education
Ongoing Research

"Usefulness perception of dentists, academics and students of the VirTeaSy haptic virtual reality simulator in dental education"

Results

1. To what extent can the simulator be helpful in teaching manual skills in dentistry?

2. To what extent can the simulator be useful in self-training of manual skills in dentistry?

3. To what extent can the simulator be useful in evaluating manual skills in dentistry?

4. To what extent is the sensation provided by the simulator similar to drilling in a real tooth?

5. To what extent is the sensation provided by the simulator similar to drilling in an acrylic/marfinite tooth?
6. To what extent is the grip of the simulator similar to a high-speed turbine grip?

7. To what extent is the use of the simulator comfortable?

8. What is the extent of your previous experience with virtual reality simulators?

9. What is the extent of your previous experience with virtual reality haptic simulators?

10. Rate your confidence level in using a computer

11. What is your level of experience with Videogames?
12. What is your level of experience with 3D technology?

Sample Distribution of the Answers to Questions 1 to 7

Gender Distribution of the Answers to Questions 1 to 7

Age Distribution of the Answers to Questions 1 to 7

Females: 61% of the Sample
Males: 39% of the Sample

20 - 24: 37% of the Sample
25 - 29: 34% of the Sample
30 - 34: 14% of the Sample
35 - 49: 10% of the Sample
50 - 61: 4% of the Sample
Distribution of Students Answers to Questions 1 to 7

- 60% of the Sample

Distribution of Students Answers to Questions 1 to 7

- 4th Year: 9% Califica, 91% No Califica
- 5th Year: 15% Califica, 85% No Califica
- 6th Year: 15% Califica, 85% No Califica

Distribution of Dentist/Academics Answers to Questions 1 to 7

- 30% of the Sample

Distribution of Dental Practitioners Answers to Questions 1 to 7

- 10% of the Sample

Free Comments

<table>
<thead>
<tr>
<th>Comment</th>
<th>Number of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of water</td>
<td>1</td>
</tr>
<tr>
<td>Spatial orientation problems with the 3D</td>
<td>18</td>
</tr>
<tr>
<td>Difficulty to handle for a Left-Handed</td>
<td>3</td>
</tr>
<tr>
<td>Excellent complement to preclinical work (Not replaceable)</td>
<td>9</td>
</tr>
<tr>
<td>Headache after use</td>
<td>1</td>
</tr>
<tr>
<td>Lack of a good support for the working hand</td>
<td>25</td>
</tr>
<tr>
<td>Dizziness after use</td>
<td>3</td>
</tr>
<tr>
<td>Excellent technological tool</td>
<td>4</td>
</tr>
<tr>
<td>Need for more practice to achieve good performance</td>
<td>5</td>
</tr>
</tbody>
</table>

Discussion

As it has being published by other studies, were they evaluated perception of students and Faculty, the majority of the participants evaluated as **positive** their experience with the VirTeaSy HVR Simulator, meaning that could bring **benefits** from it’s use in **Teaching and Learning manual skills** in dentistry, differing mildly from Gal’s work in parameters like realistic sensation (lower or medium), grip of turbine (medium) and drilling (use of computer mouse).
Conclusions
Concepción's students with clinical practice, dental practitioners and dentists/academics rate as POSITIVE the use of the VirTeaSy haptic virtual reality simulator in dental education; regardless of their previous experience with a simulator, video-gamming experience, 3D experience, age or gender.

Personal Conclusions

There are still technological improvements to be made, in the development of:
- A comfortable support for the working hand
- Better tactile sensation
- Better 3D spatial orientation
- A Spanish version of the Software (Maybe Tailor-made one)
- More Maxillary Exercises

References