Academic Evaluation of Simodont® Haptic 3D Virtual Reality Dental Training Simulator

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Background: Visual, acuity and sensory motor skills are essential for performing different procedures in Dentistry. The importance of repetitive training and practice of fine manual skills in improving long-term performance and spatial perception of dental procedures has been proven [34]. The use of a haptic device would allow the user to capture tactile sense with minimal intervention from the instructor [1]. Haptic technology, or Haptics, is tactile feedback technology which enhances the advantage of a user's sense of touch by applying vibratory, proprioceptive, or motions upon the user. The literal meaning of haptics is “I fasten onto, I touch” [2]. Haptics technology has been used widely in the fields of aviation, telecommunication and medicine [3]. Study in Dentistry, early studies investigated haptics technology in different fields such as Orthodontics [4], Restorative Dentistry [5], Orthognathic Surgery [6], Implantology [7] and Endodontics [23]. In the past decade, attempts were made to develop a dental simulator by Luciano [8], Wang et al.[9], Kim et al.[10], Ranta et al. [11] and Yao et al.[12]. Most of these dental simulators are still in the early, or even experimental phase of development [16]. Haptic technology seems to have a bright future in dental education, hence our study aimed at evaluating Simodont® haptic virtual reality dental training simulator.

Materials and methods: Eleven academic staff members from the School of Dentistry and Oral Health (Griffith University) volunteered to participate in this study to evaluate the fidelity of the new Simodont® haptic 3D VR dental trainer (Figure 1) and to assess its value as a new tool in preclinical dental training and early development of Psychomotor skills. The Simodont® is manufactured by Moog Industrial Group, Amsterdam. The Simodont® coursework and software has been developed by ACTA (Academic Centre for Dentistry in Amsterdam) and is currently being trialed in a variety of curricula. The courseware allows a variety of operative dental procedures to be practiced in a virtual oral and dental environment with force feedback. All academic staff members were asked to complete a pre-experimental questionnaire (Table 1). All tasks given to the participants during the evaluation session were identical and included manual dexterity exercises, clinical exercises on a single tooth as well as a simulated full arch experience with teeth present in contact (Figure 2).

Table 1: Showing Means and Standard Deviations, and frequency distributions of answers of the pre-experimental questionnaire.

Results: The results obtained from our pre-experimental questionnaire showed that the academic staff members of the School of Dentistry and Oral Health (Griffith University) were almost neutral in regards to the Simodont® Dental trainer (Table 1).

Table 2: Showing Means and Standard Deviations, and frequency distributions of answers of the post-experimental questionnaire.

Conclusions and recommendations: 1-The Simodont® dental trainer was accepted by academic staff members in our study as a new educational tool.

2-Most of the advantages of the Simodont® are seen to be educational while the reported limitations and missing element were technical.

3-The majority of academic staff members hold the view that dental simulation can replace some traditional educational methods and cannot replace a human lecturer or tutor.

4-More studies are required to investigate the value of short and long term use of Simodont® in dental training for early years students and senior students.

5-A detailed comparison between Simodont® and other available dental simulators using a universal valid ranking system is needed.

6-Comparing the effect of using Simodont® versus traditional training methods in development of new skills would be helpful for further evaluation of the new dental trainer.

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