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The haptic 3D virtual reality dental training simulator as a good educational tool in preclinical simulation learning



Dental education emphasizes the clinical skill competency-based training as well as the assessment of clinical training outcome.¹ The simulation laboratory learning is very important to mimic clinical dental procedure in preclinical dental education. Manikins and physical typodonts are the basic infrastructures used in simulation-based dental education. However, there are some disadvantages in traditional methods such as the consumption of consumables, time-consuming for supervision, and the scoring consistency.

In 2019, the haptic 3D virtual reality dental training simulator Simodont[®] (Moog Inc., Nieuw-Vennep, Netherlands) was implemented into simulation laboratory learning courses, School of Dentistry, Chung Shan Medical University (CSMU), Taichung, Taiwan. Simodont[®] provides the virtual 3D dental environment and mimics the touch sensations of clinical drilling procedures such as caries removal, tooth preparation, and pulp chamber opening through the sensory feedback.² This device not only simulates the clinical scenario but also provides the unlimited learning opportunity. In addition, the progress of learning can be traced, recorded, and scored. It is really exciting to initiate Simodont[®] in the preclinical dental education for the assistance in hand skill training for undergraduate dental students in CSMU.

Little is known about the comparison between haptic dental simulator and conventional dental simulator using the same evaluation modules. In this article, the authors presented the preliminary questionnaire survey of year 104 dental students who have one-year learning experience of Simodont[®] in CSMU. A total of 71 dental students participated the preclinical assessment in sixth grade and 43 students (23 females and 20 males) completed the ques-

tionnaire. The questionnaire contained three sections of cavity preparation, access cavity preparation, and crown preparation about the learning experiences of Simodont[®] which was superior and closer to clinical scenario than conventional dental simulator, respectively. The results by Twenty Likert scale questions with five response options were illustrated in Fig. 1. About 86.05%, 86.05%, and 81.40% of the dental students agreed that Simodont[®] could be helpful in preclinical learning for cavity preparation, assess cavity preparation, and crown preparation procedures, respectively.

In this study, Simodont[®] exhibited as the great interesting training tool from the student's perceptions. Simodont[®] has been used for preclinical assessment in cavity preparation and tooth preparation.^{3,4} This system could allow the students to obtain reliably during daily practice. However, the dental educational curriculum design for haptic 3D virtual reality dental training still need to be constructed and further evaluated for this newly developed facility.

Recently, the COVID-19 pandemic has interrupted the traditional educational activities.^{2,5} Simodont[®] has been drawn attention that could provide the real-time feedback between instructors and students.⁵ In addition, the laboratory curriculum transition from conventional simulation learning to 3D virtual reality training environment could not only provide the practice repeatedly, but also let dental students improve their manual finesse skills and stereoscopic sense for hand-eye co-ordination. It also reduces the consumption of dental consumables to facilitate the green environment. Taken together, Simodont[®] acts as a good educational tool in preclinical simulation learning.

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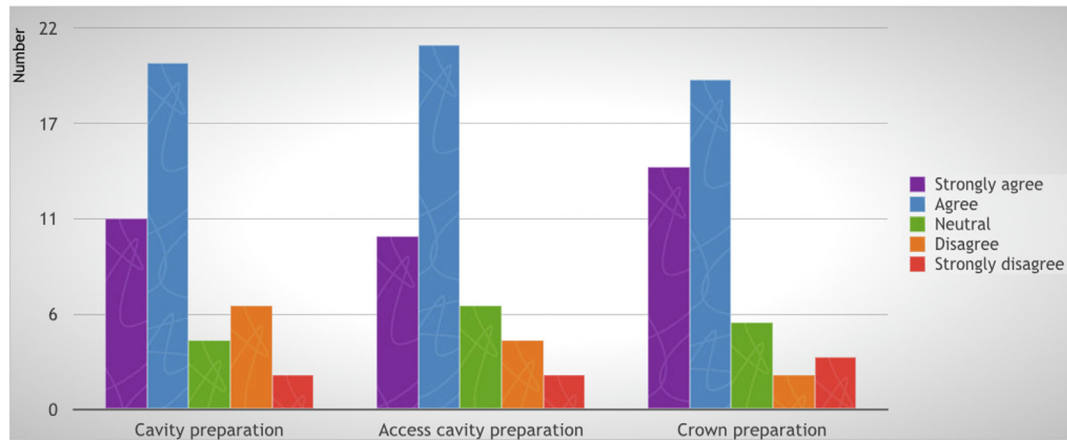


Figure 1 The responses for the questionnaire: Compared with the traditional dental model, the experience of cavity preparation, assess cavity preparation, and crown preparation in Simodont® is more interesting and closer to the clinical situation, respectively. A five-point Likert scale was used to measure the opinions of the participants.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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