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Dental interns' perceptions of immersive simulated reality scenarios for local anesthesia learning

The outbreak of COVID-19 and the coming of digital era, extended reality technologies become popular in dental education.[1,2] Immersive virtual reality technologies offer unprecedentedly vivid environments and realistic experiences that users can see, hear, and interact with virtual environments. HTC Vive (HTC Corporation, Taipei, Taiwan) was the first immersive virtual reality apparatus launched in virtual reality digital learning center at School of Dentistry, Chung Shan Medical University (CSMU) in 2019. The immersive simulated reality scenarios could give the "real-life" experiences to dental students. Combined with serious game developed for the purpose of teaching a specific knowledge and skill, it might effectively enhance students' knowledge, problem-solving skills, self-confidence, and learning motivations.

A task of immersive virtual reality for local anesthesia learning was designed by the faculties affiliated at Department of Oral and Maxillofacial Surgery, CSMU. Briefly, the virtual dental clinic was developed to perform the left inferior alveolar nerve block on a hypertension patient for tooth 38 extraction in the game software. First. the player was asked to select the correct anesthetic and dental injection needle, respectively. During cleanup procedure, the player was asked to correctly remove dental injection needle from the syringe and throw away the used needle into a disposal box. This task provided the immediate response to player. If the answer was wrong, the player had to start over and could not enter the next step.

In this survey, five questions were designed to explore the effect of dental students' perceptions of immersive simulated reality scenarios for local anesthesia learning. Total 21 dental interns were invited to take this anonymous online survey. The responses of Likert scale rating score are shown in Table 1. About 85.7%, 90.5%, 42.9%, 85.7%, and 95.2% of dental interns agreed that immersive virtual reality for local anesthesia learning could facilitate patient safety, elevate self-esteem, improve communication skills, benefit repetitive practices, and enhance environmental sustainability, respectively.

So far, this is the first study about the use of immersive virtual reality apparatus for local anesthesia learning. Similar results were reported that both virtual reality and mixed reality dental simulators have been applied in oral surgery learning for tooth extraction and local anesthesia.[3,4] These extended reality technologies were found to facilitate dental students with realistic expectations of clinic scenarios. The advantage of immersive virtual reality apparatus is very cost effective. Combine with rigorous task established, immersive simulated reality scenarios can be applied in different dental specialties.

This task for local anesthesia learning could not only increase the confidence of dental students, but also improve patient safety in further clinical settings. In addition, this could achieve the sustainable development goals 10 (reduced inequalities) and 12 (responsible consumption)

Table 1 Dental interns' perceptions of immersive simulated reality scenarios for local anesthesia learning.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Facilitate patient safety	10 (47.6%)	8 (38.1%)	2 (9.5%)	1 (4.8%)	0 (0%)
Elevate self-esteem	11 (52.4%)	8 (38.1%)	0 (0%)	2 (9.5%)	0 (0%)
Improve communication skills	5 (23.8%)	4 (19.0%)	9 (42.9%)	3 (14.3%)	0 (0%)
Benefit repetitive practices	15 (71.4%)	3 (14.3%)	2 (9.5%)	1 (4.8%)	0 (0%)
Enhance environmental sustainability	15 (71.4%)	5 (23.8%)	0 (0%)	1 (4.8%)	0 (0%)

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by repetitive practices and environmental sustainability, respectively.[2,5] However, the score of communication skills was the lowest among five questions. The main reason might be due to the lack of interaction with real patients.

Taken together, the immersive simulated reality scenarios could help dental students to memorize the steps in local anesthesia. This may empower dental students to fulfill their role and treatment for patients in further clinical settings. However, further improvement of current task by immersive simulated reality scenarios is required.

Declaration of competing interest

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

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