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An Accessible 3D Printed Head Model for Simulation of Ophthalmoscopy for Medical Training

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Abstract
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Abstract

Purpose: To examine the utility and effectiveness of an accessible 3D-printed head model for ophthalmoscopy simulation training in a medical education setting.
Setting/Venue: The Faculty of Medicine at Memorial University of Newfoundland.

Methods: A 3D printed head model was designed by 3D scanning a volunteer’s head which was then uploaded into CAD software. The model was then sliced to allow for a mobile phone to be inserted behind the eyes for viewing of pathology. Simulated eyes were created using 3D printed molds with a 23mm focal length lens inserted to simulate the focal and axial length of a human eye. Medical trainees were voluntarily recruited to complete a pre-session survey to assess their experience and confidence in Ophthalmoscopy. They were then given the opportunity to practice ophthalmoscopy using the model for 30 minutes and then asked to complete a post-session survey to assess for changes.

Results: There were a total of 35 participants from all years of training including pre-clerkship (23), clerkship (7), and residency (5). 80% of participants indicated that they had not used medical simulation devices before and the majority found that the head model accurately simulated ophthalmoscopy and retinal pathologies 4.4 (SD ± 0.75). Overall students' confidence in performing ophthalmoscopy increased significantly ($p < 0.001$).

Students scored the device a 4.67 (SD ± 0.6) on average on a Likert scale indicating they would find or would have found the device useful prior to clinical experiences, and the majority of learners 31/35 (88%) indicated that they would use the device in the future. Negative feedback included images appearing pixelated, and due to the light emitted from the phone, the ophthalmoscope did not necessarily need to be turned on.

Conclusions: Overall participants indicated that they had minimal exposure to simulation devices, but that the model accurately simulated direct ophthalmoscopy, improved confidence in ophthalmoscopy, and would be a helpful addition to medical education to enhance learning prior to clinical rotations. Future uses of the device include ophthalmology and ENT surgical simulation as well as otoscopy.