

Development and procedural evaluation of immersive medical simulation environments

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We present a method in designing a medical simulation environment based on task and crisis analysis of the surgical workflow. The environment consists of real surgical tools and instruments that are augmented with realistic haptic feedback and VR capabilities. Inherently, we also addressed a broad spectrum of human sensory channels such as tactile, auditory and visual in realtime. Lastly, the proposed approach provides a simulation environment facilitating deliberate exposure to adverse events enabling mediation of error recovery strategies. To validate the face validity of our simulator design we chose a spinal procedure, the vertebroplasty, in which four expert surgeons were immersed in our medical simulation environment. Based on a Likert-scale questionnaire, the face validity of our simulation environment was assessed by investigating surgeon behavior and workflow response. The result of the conducted userstudy corroborates our unique medical simulation concept of combining VR and human multisensory responses into surgical workflow.

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