

# Virtual Reality in Ophthalmic Surgical Education: Current Innovations and Future Perspectives [Letter]

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## Dear editor

We read with great interest the article by Ahuja et al on virtual reality in ophthalmic surgical training.<sup>1</sup> The authors provide a concise yet comprehensive overview of the current virtual reality (VR) and augmented reality (AR) applications in ophthalmic surgical training while also highlighting emerging technologies such as the Meta Quest and Apple Vision Pro that may further expand their use. However, we would argue that the AAO VR Education App, although utilizing VR technology, is primarily an educational resource rather than a surgical training tool and therefore falls outside the scope of the topic of interest. We additionally commend the authors for their precise use of the terms VR and AR when describing technologies as these concepts are sometimes used interchangeably despite having distinct meanings. Consistent terminology is important for comparing studies and accurately describing the role of VR simulation in ophthalmic surgical education. While the authors correctly discuss construct validity evidence across different technologies, we believe face and content validity are also important to include in the discussion, as well as the need for future studies to clearly define the validity evidence they seek to evaluate.

The authors correctly identify and define construct validity evidence for each simulator, demonstrating its ability to distinguish between skill levels of participants. However, construct validity alone does not address whether a simulator is realistic or representative of the skills it is intended to teach. Focusing only on construct validity may also overlook literature, involving face and content validity, that has contributed to simulator validation. Face validity refers to how “realistic” the simulator simulates actual surgery while content validity addresses whether the simulator includes the skills and tasks it claims to train.<sup>2</sup> Regarding EyeSi, evidence supporting all aspects of content validity has been reported for cataract surgery simulation.<sup>3</sup> Additionally, Jaud et al demonstrated content validity for vitreoretinal surgery by selecting simulator modules that were representative of a vitreoretinal surgery curriculum through expert feedback.<sup>4</sup> However, studies specifically evaluating face validity are lacking. Face and content validity of the HelpMeSee simulator’s scleral tunnel construction module were recently demonstrated by Nair et al through evaluations by experienced MSICS surgeons, who reported that the simulator realistically represented the eye, surgical steps, instruments, and complications.<sup>5</sup>

Lastly, we would like to emphasize the importance of carefully defining validity in simulator-based studies, given the relative scarcity of validity studies in ophthalmology literature compared to other fields.<sup>3</sup> Notably, a 2020 systematic review of simulation-based training tools for technical and non-technical skills in ophthalmology found that a majority of studies lacked a formal validation process.<sup>3</sup> Defining validity involves identifying what constructs the simulator is designed to measure, showing how well it actually measures, and constantly improving its limitations.<sup>2</sup> Doing so does not change what is actually observed in terms of trainee performance but leads to an accurate framing of their meaning. Failing to properly define validity risks interpreting simulator outcomes beyond what they were originally intended to measure. Thus, to mitigate the potential for

misrepresentation, studies should seek to establish validity during development rather than retrospectively, scoring systems should involve metrics that indicate expertise over efficiency, and real-world evaluations should be integrated as complementary evidence for competency where available.

Despite these considerations, we commend the authors for highlighting relevant literature and future directions in VR ophthalmic surgical training. It is important to consider all aspects of validity when comparing validation across technologies and to critically evaluate study design in the context of simulator design. Doing so will help identify which aspects of validity would benefit from further study across different training modalities and, as a result, strengthen the evidence supporting the incorporation of simulators into ophthalmic surgical training programs.

## Disclosure

Lansingh VC is a consultant with HelpMeSee and reports travel expenses for attending meetings from HelpMeSee. Fynn-Thompson N is an employee of HelpMeSee and reports travel expenses for attending meetings from HelpMeSee. Nair AG is a consultant with HelpMeSee Vision and reports lecture fees from Rammi Enterprises Pvt. Ltd., stock options from Senores Pharmaceuticals and Wockhardt Pharma. The authors report no other conflicts of interest in this communication.

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