in complex cases.[20] Thus, while VR could reduce early operational costs and complications, evaluation by human supervisors would still be a necessity.

NO GREEN LIGHT YET ON VR

Despite the apparent benefits of VR for patient care and medical training, further research is required to ascertain whether these applications are efficient. As VR has only become accessible in the last decade, past studies were limited by the financial burden of technological obselescence, due to the rapid progress of the VR field. Furthermore, previous studies were often underpowererd as a result of low participant compliance.[5,21] New clinical trials with greater sample populations are needed to compare the recent advances in VR with current therapy models, treatment regiments, and teaching methods in order to support widespread VR applications.[6,12]

In addition, for therapeutic purposes, VR technology does not yet provide highly accurate haptic feedback aside from vibrations.[8] Some research argues that greater tangible senses are required to help patients relearn motions such as feeling the weight of an object, while contrasting research suggests visualization alone is adequately beneficial to practice and boost patient confidence.[2,4,8] Other studies interject by noting that most forms of haptic feedback are not necessary at all for motor skill relearning after childhood, and that positional control alone is sufficient.[22] It is unclear whether the benefits of movement practice combined with visualization outweigh the lack of physical pressure during this training.[2,8,22] However, studies have yet to assess the effectiveness of vibrations in terms of haptic feedback.

Finally, it has not yet been determined how much VR training is required to produce meaningful outcomes.[12,16] Ideally, VR training should be effective within a similar time frame to most physiotherapy sessions in order to be a sufficient replacement. Extending beyond regular therapy periods may reduce compliance or produce negative effects.[5] These concerns must be addressed before VR is standardized into the healthcare system.

THE FUTURE IS VIRTUAL

As the world progresses towards a digital age with ever-advancing technologies, VR emerges not only as an entertainment medium, but also as an impactful tool in healthcare. Its potential in rehabilitation and treatment allows for the implementation of enriching and individualized options for patient care. Additionally, VR presents a promising opportunity for education of medical professionals by providing a superior alternative to textbooks and instructional videos. Trainees will be able to virtually experience techniques and procedures to better prepare them for live patient care.

Future research must focus on the cost-efficiency of this technology and consolidate its effectiveness relative to conventional therapies. Finally, it is important to evaluate the magnitude of VR exposure required for patients and trainees to experience significant benefits. The investment in VR can profoundly enhance the face of healthcare in terms of how and when the appropriate care is delivered to patients. ■

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