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Effects of Virtual Reality Intervention on Neural Plasticity in Stroke Rehabilitation: A Systematic Review

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PRESENTED AT:

1. Introduction

Virtual reality (VR) has been increasingly adopted in medicine for recent decades, and this emerging technology has shown promising results in stroke rehabilitation.

As a computer-generated simulation technology, VR creates an enriched and gamified environment [See right figures], facilitate task-specific training and provides multimodal feedback to augment the functional recovery by driving the experience-dependent neural plasticity.

Currently, a majority of research focuses on effects of VR on functional recovery and clinical outcomes; understanding how the neural underpinnings of those effects are critical for optimizing the use of VR technology for patient care.

2. Purpose

This systematic review aimed to summarize the current literature regarding the effects of VR-based rehabilitation on neural changes in stroke patients.

3. Methods

Six literature databases were searched, including Medline via Ebsco, Embase, PsycINFO, IEEE Explore, Cumulative Index of Nursing and Allied Health, and Scopus.

The results were limited to articles published in English and between 2000 to 2020.

This review was registered at the PROSPERO (ID: CRD42020196405).

4. Results

A total of 217 records were identified from six databases, and 26 studies were finally included in this systematic review. Six common neural plasticity patterns were summarized below:

VR-induced Neural Plasticity in Stroke Rehabilitation	
✓	Improved interhemispheric balance
✓	Enhanced cortical connectivity between functional regions
✓	Increased representation mapping of the affected limb
✓	Improved neural plasticity was correlated to enhanced functional measures
✓	Increased activation of regions in the frontal cortex
✓	The mirror neuron system may be involved in VR intervention

6. Implications

This review prompts the systematic understanding of the neurophysiological mechanisms of VR-based stroke rehabilitation, provides the emerging evidence for ongoing innovation of VR system and its application in stroke rehabilitation.

5. Discussion and Conclusion

Virtual reality induced changes in neural plasticity for stroke patients, these changes reflected the neural substrates of restoration and compensation of functional deficits.

The positive correlation between the neural plasticity changes and functional recovery elucidates the mechanisms of VR's therapeutic effects in stroke rehabilitation.

References

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