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Neurophysiological approaches to enhancing public health responses in post-stroke rehabilitation.

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Introduction

Stroke remains one of the leading causes of disability worldwide, creating a substantial burden on healthcare systems and communities. Neurophysiological research has deepened our understanding of post-stroke brain reorganization, highlighting the roles of neuroplasticity, functional connectivity, and cortical excitability in recovery. These findings emphasize that rehabilitation should not only focus on physical restoration but also on stimulating adaptive neural changes. Public health strategies can integrate neurophysiologically informed rehabilitation protocols into community healthcare services, ensuring that recovery support is accessible and standardized across regions [1].

A key consideration in policy planning is the timing and intensity of rehabilitation interventions. Evidence suggests that early, intensive therapy maximizes neuroplastic potential, particularly within the first three months post-stroke. Public health systems can establish guidelines that mandate early initiation of rehabilitation, supported by adequately trained staff and accessible rehabilitation centers. Incorporating neurophysiological assessment tools such as EEG and TMS into routine care can help tailor therapy intensity to individual patient needs, optimizing recovery outcomes [2].

Equitable access to rehabilitation remains a challenge, especially for patients in rural or underserved areas. Tele-rehabilitation, guided by neurophysiological monitoring devices, offers a promising solution by enabling remote therapy while maintaining individualized care. Public health initiatives should invest in digital infrastructure, train healthcare providers in tele-rehab techniques, and provide subsidies or equipment loans for patients who cannot afford such technologies. By removing geographical and financial barriers, these measures can help reduce disparities in post-stroke recovery [3].

Technological innovations can further enhance rehabilitation effectiveness. Brain-computer interface (BCI) systems, robotic-assisted training, and virtual reality programs have demonstrated potential to engage patients in repetitive, task-specific movements that drive neural recovery. Public health policies should support clinical trials and large-scale implementation of these tools, alongside developing ethical guidelines for their safe use. Partnerships between academic institutions, technology developers, and government agencies can accelerate

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the translation of neurophysiological breakthroughs into accessible rehabilitation services [4].

Sustainability in rehabilitation policy requires ongoing evaluation of program effectiveness. National stroke registries and outcome tracking systems can collect data on functional recovery, quality of life, and cost-effectiveness of neurophysiological interventions. This evidence can guide resource allocation, ensure continuous improvement, and justify ongoing investment in advanced rehabilitation approaches. By making outcome-based adjustments, public health authorities can maintain a high standard of care for stroke survivors [5].

Conclusion

Integrating neurophysiological insights into post-stroke rehabilitation policies offers the potential to improve recovery rates, enhance quality of life, and reduce long-term healthcare costs. Through early intervention, equitable access, technological integration, and evidence-driven policy evaluation, public health systems can create effective and sustainable rehabilitation frameworks. This approach ensures that stroke survivors receive the support they need to maximize functional independence.

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