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Integrating neurophysiological biomarkers into public health strategies for dementia prevention.

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Introduction

Dementia represents a growing public health concern, with prevalence expected to rise dramatically as populations age. Advances in neurophysiology have identified early biomarkers—such as altered EEG rhythms, reduced synaptic plasticity, and disrupted connectivity patterns—that may signal preclinical stages of dementia. Public health systems can harness these markers to develop large-scale screening initiatives, enabling early intervention and potentially delaying disease onset. The integration of neurophysiological diagnostics into primary healthcare frameworks would require standardized protocols, trained personnel, and accessible testing facilities, ensuring that at-risk individuals are identified well before cognitive decline becomes irreversible [1].

Early detection alone is insufficient without targeted preventive measures. Neurophysiological research has shown that interventions such as cognitive training, aerobic exercise, and non-invasive brain stimulation can strengthen neural networks and enhance cognitive reserve. Public health policy could embed these interventions into community wellness programs, offering group-based cognitive exercises or subsidized fitness activities designed to improve brain health. By combining screening with intervention, policymakers can move toward a proactive rather than reactive approach to dementia care [2].

Equity in dementia prevention is crucial. Populations in rural or economically disadvantaged areas often lack access to specialized neurological services. Tele-neurophysiology platforms, which transmit EEG or MEG data for remote analysis, can bridge this gap. Public health initiatives should prioritize funding for mobile diagnostic units, internet infrastructure, and remote training for local healthcare workers. Ensuring that neurophysiological screening and intervention programs reach underserved communities can help reduce disparities in dementia risk and outcomes [3].

Research translation is another key policy consideration. While numerous studies highlight the promise of neurophysiological biomarkers, large-scale implementation demands robust evidence from longitudinal studies and multicenter trials. Public health authorities can foster collaborations between universities, hospitals, and government agencies to pool resources and share data. Funding mechanisms should incentivize projects that examine real-world effectiveness, cost-benefit analyses, and cultural

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adaptability of neurophysiological dementia prevention strategies [4].

Long-term sustainability of such programs depends on continuous monitoring and adaptation. Public health surveillance systems could integrate neurophysiological data into broader health registries, allowing policymakers to track dementia incidence, evaluate program outcomes, and refine prevention strategies accordingly. This evidence-driven approach ensures that resources are directed toward interventions that have measurable impacts on population brain health [5].

Conclusion

Incorporating neurophysiological biomarkers into public health dementia prevention programs offers a promising pathway to reduce disease burden and improve quality of life for aging populations. By combining early detection, targeted intervention, equitable access, and ongoing research integration, health systems can shift toward a proactive model of brain health promotion. Such policies not only address the needs of individuals but also strengthen the resilience of communities against the growing challenge of dementia.

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