

## Neurofeedback: A Non-Invasive Approach to Brain Self-Regulation and Its Applications

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### ABSTRACT

Neurofeedback is a scientifically grounded, non-invasive method that enables individuals to modulate brain activity through real-time EEG-based feedback. By translating brainwave patterns into visual or auditory stimuli, users learn to self-regulate neural function, achieving improved cognitive, emotional, and physiological balance. This form of operant conditioning has demonstrated clinical efficacy across a range of disorders, including anxiety, ADHD, PTSD, insomnia, chronic pain, and neurodevelopmental or neurodegenerative conditions. Training protocols are customized based on initial quantitative EEG (qEEG) assessments, targeting specific dysregulations in brainwave activity. In addition to therapeutic contexts, neurofeedback has gained traction in domains requiring sustained performance under pressure, such as elite sports, aviation, and military operations. It is used to enhance focus, stress resilience, decision-making, and emotional regulation, often as part of broader peak performance or mental preparedness programs. Protocols may be integrated with complementary measures such as heart rate variability (HRV) biofeedback and are suitable for both individual and group interventions.

As a non-pharmaceutical and adaptive modality, neurofeedback supports long-term neuroplastic change and offers a safe, personalized tool for optimizing mental function across clinical and high-performance populations.

**Keywords:** neurofeedback, biofeedback, qEEG, neurodegeneration, neurodevelopmental conditions

### References:

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