

# Exercise-Driven Brain Adaptation: Unlocking Athlete Cognition and Neuroplasticity: A Narrative Review

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## ABSTRACT

Neuroplasticity is the brain's lifelong capacity to reorganise, driving habit formation, skill learning, and recovery. In sports, it supports motor learning, coordination, reaction time, and skill refinement. Repetitive, task-specific practice strengthens the motor cortex and enhances brain muscle communication.

This review aims to explore the role of neuroplasticity in sports training with a focus on motor learning, skill acquisition, performance, and rehabilitation.

A narrative review was conducted. Databases including PubMed, Google Scholar, Research Gate, and ScienceDirect were searched for studies published between 2017 and 2025 using key terms. Identified publications were searched by title and abstract.

The database search yielded a total of 345 articles of which only 10 met the inclusion criteria. Training induces neuroplastic changes, improving cortico-spinal connectivity, coordination, and reaction time. Open-skill sports enhanced decision-making and attention, while closed-skill sports improved precision and memory. Case evidence and experimental studies confirmed cortical reorganisation through task-specific practice. Neuroplasticity also supported rehabilitation, emotional adaptation, and return-to-play.

This review concludes that exercise induces neuroplastic changes which significantly improves the performance of athletes.

**Keywords:** Athletes, Cortical reorganisation, Motor learning, Sports rehabilitation

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