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Opinion Article

Acquiring Muscle Memory in Yoga Training- an Opinion

Santhi Silambanan[1*], Abinaya[2], Shobana R[3], Mahesh Kumar[4], Poornima Ravi[5]

[1]*Department of Biochemistry, Sri Ramachandra Medical College & Hospital, SRIHER, Chennai*

[2]*Department of Physiology, A.C.S Medical College & Hospital, Dr. M.G.R. Educational & Research Institute*

[3]*Department of Physiology, A.C.S Medical College & Hospital, Dr. M.G.R. Educational & Research Institute*

[4]*Govt Yoga & Naturopathy Medical College, Chennai*

[5]*Department of Yoga, Govt Yoga & Naturopathy Medical College, Chennai*

***Corresponding author:** Dr. Santhi Silambanan, Professor, Department of Biochemistry, Sri Ramachandra Medical College and Research Institute, Sri Ramachandra Institute of Higher Education and Research (SRIHER) (DU), Chennai, Tamil Nadu, India.

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Abstract

In yoga training, there is consistent practice and repetition of asanas, which enhances individuals to perform the asanas automatically and easily. Asanas improve the strength, blood, nutrient, and oxygen flow to various tissues including the skeletal muscles. Training involving repeated practice, sequential steps in the asanas and holding poses for the stipulated time improve the sensory and motor skills of muscles. Due to the specific movements in the asanas, the brain and muscle reach a state of awareness, thus aligning the body according to the posture expected out of the asanas. Practising daily reinforces the neural network, facilitating the automatic attainment of the postures. However, building a strong muscle memory needs time, patience and mindset.

Keywords: Yoga, Asanas, Mindfulness Meditation, Muscle Memory, Neural Network

Introduction

Memory is the recollection of past or specific events stored in our brain. When it comes to muscle memory, it is a motor skill that is learnt and retained for example riding a bike [1]. Muscle memory is defined as the ability of skeletal muscle to respond differently to external stimuli in an adaptive (positive) or maladaptive (negative) way if the stimuli have been encountered before. This phenomenon involves both cellular adaptations, such as the preservation of myonuclei, and molecular alterations like DNA methylation, which together influence how muscle responds in the future [1]. Although resistance and endurance training are the primary focus of most research on muscle memory, there is increasing evidence that mind-body practices, such as yoga, may induce similar cellular and molecular changes. Yoga and related therapies can alter gene expression and DNA methylation, particularly in pathways associated with inflammation, stress response, DNA repair, and cellular longevity, according to recent narrative and systematic reviews [2]. Thus, yoga may serve as a low-impact modality capable of promoting muscle memory, supporting resilience, and faster adaptation after periods of inactivity.

Objective

This summary aims to explore the mechanism and significance of muscle memory with the execution of yoga postures.

Methods

The present summary evaluates the function of muscle memory in yoga practice through a structured, literature-based methodology. Systematic searches were conducted in databases such as PubMed and Scopus using keywords including muscle memory [Title/Abstract] and found 88 articles. English-language studies that address the neuromuscular adaptations in yoga or related movement disciplines were the primary focus of the inclusion area. The study design, participants, and assessment, such as questionnaires and neuroimaging, were the outcome measures. Findings were thematically synthesized to identify consistent patterns in proprioception, motor control, and neural plasticity that occur with regular yoga practice.

Result

Research demonstrated that practicing yoga improves motor learning and efficiency. A 10-week yoga intervention in older adults did not affect cognition but produced notably quicker reaction times and movement durations during motor learning tasks, changes that correlated with elevated brain-derived neurotrophic factor (BDNF) levels, a key mediator of neural plasticity [3]. Yoga practitioners show increases in gray matter volume and cortical thickness in brain regions related to motor control and memory, including the hippocampus and prefrontal cortex, according to neuroimaging studies, which support these functional outcomes. This suggests structural improvements supporting the motor facility [4].

Discussion

In yoga, proprioceptive adaptation, brain plasticity, and motor learning all contribute to muscle memory. Regular practice strengthens sensorimotor pathways, which facilitates smoother asana transitions with less conscious effort. Mechanism involves Long-Term Potentiation (LTP) within the primary motor cortex, which enhances synaptic strength following repeated use, a hallmark of motor memory consolidation. This allows for more automatic execution of complex movements [5]. On a cellular level, yoga-induced hypertrophy recruits satellite cells that donate new myonuclei to muscle fibers. These additional nuclei are retained even after periods of detraining, providing a long-term muscular adaptation that accelerates retraining [6]. Furthermore, resistance exercise like Surya Namaskar may induce epigenetic modifications, particularly DNA hypomethylation in genes related to muscle growth and metabolism. Even after extended periods of inactivity, these changes "prime" the muscle, enabling increased gene expression and quicker adaptability upon retraining [7]. The CNS receives signals from muscle spindles when they sense stretch. Yoga refines proprioception by improving the sensitivity of muscle spindles and the central integration of sensory input in the cerebellum, parietal lobe, and somatosensory cortex, thereby enhancing body awareness and postural control [8]. In the cerebellum and basal ganglia, repetitive motions like asanas create motor engrams, which are neural patterns that are stored for skilful actions. The essence of muscle memory is reflected in these, which may be recovered with little conscious effort [9].

Conclusion

Through neurophysiological and cellular processes like motor learning, neuronal plasticity, myonuclear retention, and epigenetic priming, yoga may improve the memory of skeletal muscles. These modifications allow smoother transitions and enhanced control during practice by enhancing proprioception, effortlessness of movement, and quick retraining. This makes yoga a useful tool for improving performance and motor rehabilitation in addition to physical wellness.

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