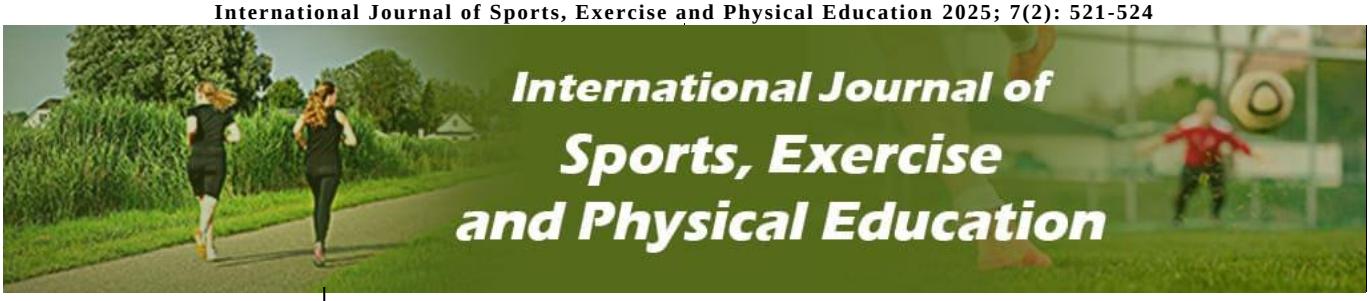

ISSN Print: 2664-7281
ISSN Online: 2664-729X
Impact Factor: RJIF 8.15
IJSEPE 2025; 7(2): 521-524
www.sportsjournals.net
Received: 23-08-2025
Accepted: 27-09-2025

Sergei Shilovskikh
Athlete and Expert in Karate
San Diego, USA

Corresponding Author:
Sergei Shilovskikh
Athlete and Expert in Karate
San Diego, USA

Neurophysiological foundations of body-mind interaction in karate techniques

Sergei Shilovskikh

DOI: https://www.doi.org/10.33545/26647281.2025.v7.i2g.269

Abstract
The aim of the study is to determine the neurophysiological mechanisms of integration of cognitive, emotional and motor components in the process of performing Kyokushin karate techniques under conditions of intense physical and mental stress.
Methods and organization of research: The study is based on empirical observations conducted by the author during thirteen years of karate training, including participation in international competitions and training camps. Bodily reactions, cognitive states, and features of respiratory coordination during the performance of kata and kumite elements were analyzed. Special attention is paid to the practices of ritualized reproduction of movements, directed focusing (kim), as well as the phenomena of bodily awareness and emotional self-regulation.
The results of the study and their discussion: It has been revealed that regular practice of karate techniques contributes to the steady formation of neuromotor patterns, synchronization of interhemispheric interaction, activation of sensorimotor and frontal areas of the cerebral cortex. These processes provide high adaptivity to stressful conditions and contribute to the development of neurophysiological efficiency the ability to quickly mobilize the resources of the nervous system in response to external stimuli.
Conclusion: The practice of Kyokushin karate forms a stable functional system that ensures the integration of body and mind, which allows the athlete to achieve high efficiency in a variable environment. The results obtained require further systematic research using instrumental neurophysiological methods.

Keywords: Kyokushin karate, neurophysiology, body-cognitive integration, mindfulness, kime, sensorimotor coordination, breathing, stress tolerance

Introduction
In recent years, there has been a steady growth of interest in practices aimed at the holistic connection of the mental and physical, a trend widely represented in both clinical psychology and neuroscience. In these fields, ideas from Eastern traditions particularly Buddhism and Japanese martial systems have laid an unshakable foundation for a paradigm in which the mind and body are interpreted as intertwined and mutually conditioned components of a single functional mechanism. In this light, the Japanese concept of *shin-shin ichinyo* "the unity of mind and body" vividly illustrates this philosophical basis [4, 8].
Modern experimental research confirms that mindfulness and meditative practices have a tangible impact on an individual's psycho-emotional state as well as on their physiological and neuronal processes. A similar transformation is observed with regular training in Eastern martial arts (such as karate), where motor activity and the cognitive component of performance are manifested as inseparably interconnected elements.
One of the most expressive forms of such practices is Kyokushin karate a style that originated in Japan in the mid-20th century and subsequently gained widespread popularity, including in the Russian cultural environment. This martial art is not merely a physical activity that develops strength, coordination, and endurance, but a deeply rooted philosophical model of personal development. In it, the exercises of *kata* and *kumite* require not only motor precision and physical stamina but also a maximum level of mental concentration, moral stability, and full conscious engagement [1].

It is precisely under the conditions of such training, which involves the simultaneous awareness of bodily signals, control over emotional reactions, and effectiveness in action, that the neurophysiological link between mind and body is most clearly expressed.

Concurrently, scientific research increasingly views martial arts as clear models for analyzing the somatic and neurocognitive mechanisms underlying the processes of personal self-construction, stress resilience, and the development of mindfulness skills. This is evident, for example, in the MBSR (developed by J. Kabat-Zinn) and MBCT approaches, which demonstrate the productivity of mindfulness practice in therapeutic and educational fields, opening up the prospect of including similar methods in sports and pedagogical training systems [5].

This is especially relevant for karate, as the practical implementation of its techniques is continuously linked to attention training, impulse control, and internal organization, making it a favorable platform for studying the correlation between physical and cognitive functioning [2].

Thus, Kyokushin karate represents a rare research plane for analyzing the foundations of the neurophysiological unity of body and mind. The purpose of this article is to systematize accumulated data and empirical observations in order to identify the leading mechanisms through which physical activity and mental practice within karate ensure the integration of emotional, cognitive, and bodily processes.

Research Methods and Organization

This work is based on the author's thirteen-year personal practical journey in Kyokushin karate from the initial level of training to competing on the international stage (including tournaments held in Romania, Austria, Portugal, and New Zealand). The material is structured on the basis of a long-term, consistent, and comprehensive immersion in the martial art system, in which karate was understood not only as a motor activity but also as a method of psychophysiological self-tuning and building an organic union of physical and mental components.

The empirical basis consisted of the author's own observations recorded during training, a detailed analysis of the conditions, goals, and tasks characteristic of training camps, as well as reflective descriptions formulated after the stages of preparation and participation in competitions. Special attention was paid to episodes involving high-intensity physical and mental loads that arose in situations of stress, exhaustion, spatial isolation, and limited contact with the usual social environment a characteristic feature of the training regimen during the pre-competition period.

This study represents a combination of subjective experience, gained through years of personal practice, with a theoretical understanding of the concepts of mind-body integration in martial disciplines. This makes it possible to establish stable mechanisms of the mind-body connection that are observable in real training and competitive conditions.

Research Results and Discussion

Prolonged karate practice, especially under the extreme conditions of remote training cycles known as "survival camps," has made it possible to identify a set of neurophysiological and psychophysical patterns. These patterns manifest during the execution of technical actions and ensure the intertwining of mental and physical components. Figure 1 displays the main effects of karate on neurocognitive functions:

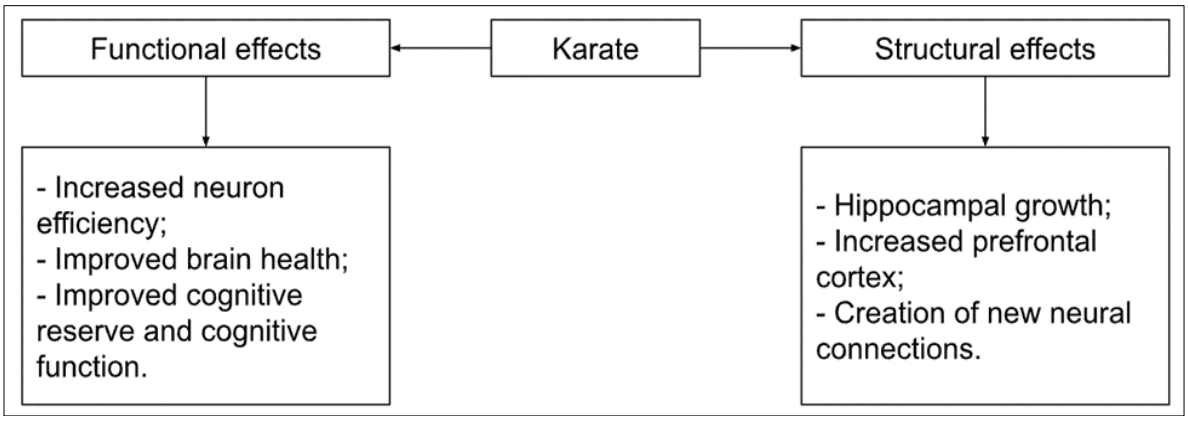

Fig 1: Structural and functional effects of karate on neurocognitive functions [10]

In a situation where the usual level of comfort is removed (absence of digital devices, regular meals, and external sensory stimulation), the individual finds themselves in a space where the main regulatory tools become internal mechanisms concentration, discipline, and sensory perception of one's own body.

One of the most pronounced observations was the transformation in the way the physical sphere is perceived: in a state of physical fatigue and a deficit of standard stimuli, processes of deep bodily awareness are activated. Attention seems to become "embedded" in breathing, coordination patterns, and micro-muscular activity, which leads to an increase in sensorimotor control and precision in actions. This is particularly noticeable in the performance of *kata* forms, where the completeness and expressiveness of each phase segment are required.

When isolated from social reference points, strict regulations, and constant coaching supervision, the central task begins to be performed by the internal capacity for mental self-regulation. Here, concentration acts not as an auxiliary element but as the main vector of productivity. It becomes evident that in the absence of mental stability, an athlete loses pace, accuracy, and motivational focus, as karate as a discipline requires not so much physical strength as a steady composure, hardened by repetitive actions under conditions of uncertainty [9].

Control over the breathing rhythm during the execution of techniques proved to be a significant element in maintaining

neurophysiological balance. During intense fatigue, it is the exhalation, synchronized with movement, that allows for the maintenance of energy efficiency and concentration. As practice has shown, only through breathing can one quickly restore focus, especially in situations of intense work on *kata* or *kumite*, where every moment demands utmost concentration [3].

The most expressive element in the performance of technical actions is the ability for instantaneous focus (*kime*) the redirection of all psychophysical energy to a single point. In *kumite*, this focus allows one not only to react instantly to an attack but also to execute a counter-attacking action with the necessary confidence, which is impossible without a developed internal readiness and volitional control. According to observations and parameters recorded through tremometric data, high-level athletes demonstrate not only refined movements but also a sensory "purity" of coordination: minimization of unnecessary touches, reduced contact time, and high bodily sensitivity. This is confirmed by subjective feelings in a combat situation, where the perception of the opponent becomes intuitive and expanded. Such a state is called "empty mind" in Eastern philosophy, where mental activity does not interfere with the body but merges with it into a single whole [6]. The physical and cognitive principles of karate are presented in detail below (See Table 1).

Table 1: Physical and cognitive principles of Kyokushin karate

Principle	Practical Manifestation	Effect
"Shin-shin ichinyo"	The fusion of mind and body in every action	Full engagement and composure
"Mind like water / like the moon"	Flexibility and reflection in combat	Emotional adaptability, predictability of actions
Repetition / ritual	Repetitive forms, cyclical nature of training	Mental stabilization, predictability of the environment
Silence and isolation	Training outside the usual sensory environment	Inner awareness, concentration

Source: Compiled by the author based on his own research

In the example of interactions in paired exercises and competitive bouts, it became apparent that even technical superiority is powerless without the proper internal mindset. The principles of "mind like water" and "mind like the moon", borrowed from the philosophical core of karate, serve the function of managing emotions, predicting the opponent's behavior, and maintaining an appropriate level of neural activity in a dynamic environment.

Based on the results of the analysis, it can be concluded that the interaction between mental and physiological structures in karate is not limited to the simple reproduction of techniques but is a complex process involving breathing, attention, emotional regulation, motor organization, and volitional composure. Thanks to this, constant practice leads not only to athletic performance but also to the development of a stable, internally balanced personality capable of maintaining equilibrium even in extreme conditions. Continuing to examine the principles of neurophysiological and psychophysical transformations that occur during the execution of technical actions in karate, special attention must be paid to the analysis of the structural and functional restructuring of brain processes, formed under the influence of systematic motor practice.

One of the central factors distinguishing karate from other motor disciplines is the prevalence of cross-body and diagonal trajectories, which form stable neuromotor connections, activate both hemispheres, and ensure enhanced interhemispheric coordination, improved reactivity, and stabilization of spatial orientation through the activation of the frontal and sensorimotor areas of the cerebral cortex, especially when performing techniques based on crossing the body's midline (See Table 2).

Table 2: Distinctive features of karate as a neurocognitive practice

Characteristic	Distinction from other forms of physical activity
Cross-body movement trajectories	Activation of both hemispheres, formation of neuromotor connections
Instantaneous focus (kime)	High precision and energy of actions, real-time mobilization
Discipline and rituality of training	Structuring of thought, reduction of mental activity randomness
Integration of physical and mental practice	Formation of a holistic personality, not just physical training

Source: Compiled by the author based on his own research

The systematic practice of *kata* carefully structured and repeatedly performed motor sequences acts as a powerful neurocognitive stimulant. In it, each movement is consolidated at both the working and long-term motor memory levels, involving the hippocampus, increasing the concentration of neurotrophins (particularly BDNF), and forming stable synaptic configurations. This is confirmed by improvements in sequential reaction performance and functional cognitive organization.

The even involvement of both sides of the body during training contributes to the formation of muscular symmetry and a balanced psychophysical state, reducing the likelihood of injuries, improving structural posture, and developing bodily sensitivity. This, in turn, leads to a reduction in anxiety states, an increase in stress resistance, and the stabilization of neural activity as a whole. Based on a number of empirical observations, it has been found that karate training affects the brain's electrical activity, enhancing the activation of the frontal and parietal regions. This reflects an increase in cognitive flexibility, the ability for attentional switching, and self-regulation. Data obtained using EEG and transcranial stimulation methods demonstrate increased excitability of the motor cortex, reduced latency of neural transmission, and improved synchrony of neuro-impulses, which indicates the optimization of sensorimotor circuits.

In a scientific context, it should be highlighted that karate practice forms what is known as neurophysiological readiness a state of ultimate functional mobilization in which the nervous system is capable of instantly reacting to external changes and controlling movement with high precision in real time. At the practical level, this is expressed in the ability to instantly enter a state of *kime*

directed focus, where mental energy and bodily impulse form a single dynamic system.

Alongside this, the influence of regular combat training on emotional regulation deserves attention, as confirmed research data show a decrease in cortisol levels, improved overall well-being, increased self-esteem, and strengthened internal motivation in representatives of different age groups from children to the elderly. This is due not only to physical exertion but also to the repetitive ritual structure of the classes, in which discipline, concentration, and cyclicity perform a stabilizing function [7].

In formulating conclusions, it should be noted that the practice of karate is not just a type of physical activity but a deeply integrated neuropsychophysiological model of development, encompassing physical, cognitive, emotional, and sensory parameters. This allows for the formation of an adaptive, volitional, composed, and internally balanced personality. Despite the methodological heterogeneity of existing research, the available results already define a convincing direction for further scientific inquiry, revealing martial arts as an effective resource for cognitive and psychophysical improvement.

Conclusion

From a scientific perspective, this study has demonstrated that Kyokushin karate, representing not only a system of defensive techniques but also a holistic philosophical-practical model, initiates complex neurophysiological mechanisms. These lead to the activation of the frontal, parietal, and sensorimotor areas of the cortex, promote interhemispheric interaction, stimulate the production of neurotrophins (in particular, the growth factor BDNF), and form stable synaptic configurations.

Based on the author's empirical material, accumulated over years of training and competition, it is confirmed that under high-intensity physical and emotional loads, mind-body composure becomes crucial. This is expressed in the ability to maintain presence in the body and sustain attentive engagement in the current activity, which becomes a determining condition not only for achieving athletic results but also for building a stable personality, its capacity for internal regulation, and adaptation to changing circumstances.

From a scientific standpoint, karate in this interpretation appears as a unique type of embodied cognition, where each action is a meaningful act in which breath, motor impulse, attention, and volitional energy form a single operational construct. It is this comprehensive nature of the discipline that determines its potential as a resource not only for training athletes but also as a tool for neuropsychological tuning, stabilizing the psycho-emotional state, and developing mindfulness skills. This gives martial arts a significant place within pedagogical, medical, and training fields.

References

1. Andronova TA, Malozemov OYu, Oshurkova OG, Sosenko AO. The multipurpose essence of martial arts (on the example of Kyokushin karate). Theory and Practice of Modern Science. 2021(12):[Internet]. Available from: https://cyberleninka.ru/article/n/mnogotselevaya-suschnost-edinoborstv-na-primere-karate-kyokusinkay. Cited 2025 Jun 20.
2. Annaev Yu. Karate as a sport: history, types, rules and modernity. Science and Worldview. 2025;(41): [Internet]. Cited 2025 Jun 25. Available from: https://cyberleninka.ru/article/n/karate-kak-vid-sporta-istoriya-vidy-pravila-i-sovremennost.
3. Voronkov AV, Soina EI. The idea of the physical and psychological principles underlying karate strokes. Young Scientist. 2020;30(320):290-1. Available from: https://moluch.ru/archive/320/72847/. Cited 2025 Jun 21.
4. Zakharov OYu, Ingerleib MB. Psychological and pedagogical features of teaching formal exercises in contact martial arts. North Caucasian Psychological Bulletin. 2017;(1):[Internet]. Available from: https://cyberleninka.ru/article/n/psihologo-pedagogicheskie-osobennosti-obucheniya-formalnym-uprazhneniyam-v-kontaktnyh-edinoborstvah. Cited 2025 Jun 24.
5. Miyata H, Kobayashi D, Sonoda A, et al. Mindfulness and psychological health among Japanese martial arts practitioners: Cross-examination. BMC Sports Sci Med Rehabil. 2020;12:75. DOI: 10.1186/s13102-020-00225-5. Cited 2025 Jun 21.
6. Nguyen TL. Psychophysiological features of karate students aged 16-17, specializing in the discipline of kata. Scientific Notes of Lesgaft University. 2020;8(186):[Internet]. Cited 2025 Jun 23. Available from: https://cyberleninka.ru/article/n/psihofiziologicheskie-osobennosti-karateistov-16-17-let-spetsializiruyuschihsya-v-distsipline-kata.
7. Tonoyan KhA, Kapitonov VYU, Vodopyanova NA. Psychological features of younger schoolchildren in karate breakout classes. Scientific News. 2022;(28):[Internet]. Cited 2025 Jun 19. Available from: https://cyberleninka.ru/article/n/psihologicheskie-osobennosti-mladshih-shkolnikov-na-sektsionnyh-zanyatiyah-po-karate
8. Yaroshenko DV. The development of a sense of distance in karate at the training stage of sports specialization. Physical Culture. Sport. Tourism. Motor Recreation. 2024;(1):[Internet]. Available from: https://cyberleninka.ru/article/n/razvitie-chuvstva-distantsii-v-karate-na-trenirovochnom-etape-sportivnoy-spetsializatsii. Cited 2025 Jun 18.
9. Yaroshenko DV. The structure of the training session at the stage of initial training of young karate players. Physical Culture. Sport. Tourism. Motor Recreation. 2020;(1):[Internet]. Cited 2025 Jun 22. Available from: https://cyberleninka.ru/article/n/struktura-trenirovochnogo-zanyatiya-na-etape-nachalnoy-podgotovki-yunyh-karatistov
10. Bhattacharya P, Chatterjee S, Mondal S. The influence of karate on neurocognitive physiology: A review article. Neurol India. 2022;70(1):11-8. DOI: 10.4103/0028-3886.338688. PMID: 35263847. Cited 2025 Jun 24.