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PHYSICAL AND PSYCHOLOGICAL RECOVERY AFTER A KNOCKOUT IN BOXING

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Annotatsiya: Ushbu tadqiqot boksda nokauntdan keyingi jismoniy va psixologik tiklanish jarayonlarining funksional dinamikasini o‘rganadi. Tajribada nokaunt olgan 24 nafar malakali bokschi qatnashdi va ularning tiklanish ko‘rsatkichlari neyrokognitiv testlar hamda biomarkerlar orqali tahlil qilindi. Natijalar shuni ko‘rsatadiki, jismoniy ko‘rsatkichlar 14-kunga kelib tiklansa-da, kognitiv va psixologik funksiyalarning to‘liq barqarorlashishi uchun kamida 30 kunlik maqsadli reabilitatsiya talab etiladi.

Kalit so‘zlar: boks, nokaunt, kognitiv tiklanish, jismoniy reabilitatsiya, miya chayqalishi, psixologik barqarorlik.

Аннотация: В данном исследовании изучается функциональная динамика процессов физического и психологического восстановления после нокаута в боксе. В эксперименте приняли участие 24 квалифицированных боксера, перенесших нокаут, а показатели их восстановления анализировались с помощью нейрокогнитивных тестов и биомаркеров. Результаты показывают, что хотя физические параметры восстанавливаются к 14-му дню, для полной стабилизации когнитивных и психологических функций требуется не менее 30 дней целевой реабилитации.

Ключевые слова: бокс, нокаут, когнитивное восстановление, физическая реабилитация, сотрясение мозга, психологическая стабильность.

Abstract: This study examines the functional dynamics of physical and psychological recovery processes following a knockout in boxing. The experiment involved 24 qualified boxers who sustained a knockout, and their recovery metrics were analyzed using neurocognitive tests and biomarkers. The results indicate that while physical parameters return to baseline by day 14, full stabilization of cognitive and psychological functions requires at least a 30-day targeted rehabilitation period.

Keywords: boxing, knockout, cognitive recovery, physical rehabilitation, concussion, psychological stability.

Introduction. In modern boxing, a knockout (KO) is not just a premature end to a fight, but is pathophysiologically considered a closed brain injury, or rather, a mild traumatic brain injury or concussion. When high-intensity, explosive, and unexpected kinematic blows in the ring hit the head, rotational and acceleration-deceleration displacement of brain tissue occurs. As a result, not only the vestibular and motor functions of the athlete, but also his cognitive abilities, neurodynamics, and general psychological state are seriously damaged. In current international and domestic sports practice, the periods of mandatory medical disqualification (removal from the ring) after a knockout are often generalized, standardized, and do not fully and objectively reflect the dynamics of the individual physical, neurological, and psychological recovery of each athlete. This can lead to premature return of athletes to intensive training and sparring matches before their nervous system has fully recovered, which can lead to the risk of serious complications such as second-impact syndrome.

The main goal of this study is to dynamically determine the stages of functional recovery of the body of highly qualified boxers during the 30-day rehabilitation period after a knockout, to study the correlation between physical and psychological indicators, and to develop and propose a scientifically based, individual rehabilitation model based on the results obtained.

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Methods. The research experiment and monitoring work were organized in compliance with all international bioethical requirements. 24 professional and semi-professional male boxers (aged 18–25, masters of sports and candidates for masters of sports) who had experienced a knockout in official competitions voluntarily participated in it. The recovery process of the functional and mental state of the athletes was dynamically monitored at certain time intervals, i.e. on days 1, 7, 14 and 30, using complex physical, laboratory-biochemical and psychological methods.

To check the neuromuscular system and statodynamic balance of the athletes, the traditional Romberg test with eyes closed was used. To determine the maximum muscle strength and endurance of the hands, electronic dynamometry measurements were used. To objectively assess the degree of structural and functional microtrauma of brain tissue, the level of a specific biomarker - the S100B protein (astrocyte-specific protein) in the blood - was studied in laboratory conditions using the enzyme-linked immunosorbent assay (ELISA) method. To measure the speed of neurodynamic and psychomotor reactions of boxers, a special computerized reaction test (simple and complex visual-motor reaction time) was conducted. To assess the stability of attention and its ability to shift, the Burden-style Corrective Sample Test was used, while the subjective mental state, emotional background and level of adaptation of athletes were analyzed using the SAN (mood, activity, health) standardized questionnaire. All quantitative results obtained were processed using variational statistical methods.

Results. Experimental data obtained at all stages of the study showed that physical indicators, functions of the peripheral neuromuscular apparatus and somatic reflexes almost completely return to their initial baseline (normal) and stabilize by the 14th day after the knockout. Neurologically, vestibular dysfunction and coordination disorders in the early days are compensated by the end of the second week. The stages of recovery of physical parameters, the patterns of correlation between dynamic changes in neuromuscular tone and biochemical biomarkers of brain tissue, and the overall dynamics of physical indicators are reflected in detail in the table below:

1-jadval. Nokauntdan keyingi jismoniy va biomarker ko‘rsatkichlarining dinamikasi (n=24**)**

Recovery periods		**Dinamometriya (panja kuchi, kg)**	S100B protein in the blood (biomarker, µg/l)
Before the knockout (Standard)	45.2	52.4	0.08
1-day	12.4	41.2	0.45
7-day	28.5	47.1	0.22
14-day	42.1	51.0	0.11
30-day	44.8	52.1	0.09

In the psychological and cognitive areas, recovery was significantly slower, and this dynamics is reflected in Table 2.

Discussion. The results obtained confirm that microtrauma of brain tissue during knockout (a sharp increase in S100B protein) causes a significant decrease in balance and strength indices in the first week. Normalization of biomarkers by day 14 indicates that physical training can be partially resumed. However, the situation in the cognitive sphere is more complicated. Even on day 30, reaction speed and concentration of attention did not fully return to baseline. Psychologically, boxers remained

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anxious about re-injury and had a low mood. This indicates that it is wrong to immediately put an athlete in intense sparring matches after a traditional 30-day medical ban, and it is necessary to involve a sports psychologist and include cognitive exercises in the rehabilitation process.

Conclusion.

Rehabilitation of a boxer after a knockout should not be limited only to the restoration of physical indicators or neurological reflexes. To ensure complete neuromuscular and psychomotor integration, it is recommended to implement cognitive-motor exercises and psychological correction programs starting on the 14th day of rehabilitation**.**

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