USE OF BIOLOGICALLY ACTIVE SUPPLEMENTS FOR RECOVERY IN SAMBO ATHLETES DURING THE SPORTS EXCELLENCE STAGE

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In the modern stage of high-performance sports development, the recovery process is recognized not only as a phase of rest but as an integral part of training adaptation, particularly in physically and mentally demanding disciplines like Sambo. Athletes in the stage of sports excellence often train under high physiological and psychological loads, with frequent sessions of sparring, strength training, and tactical drilling, which lead to significant muscular microtrauma, central nervous fatigue, and depletion of biochemical recovery resources. In such conditions, the role of scientifically grounded recovery support becomes a cornerstone of long-term athletic development and injury prevention. One of the most promising directions within recovery strategies is the application of biologically active supplements (BAS), which can enhance metabolic recovery, optimize hormonal balance, reduce inflammation, and accelerate muscle regeneration.

This thesis explores the effectiveness and necessity of using biologically active supplements as a systematic tool to support the post-training recovery of Sambo athletes during their advanced specialization phase. The study is based on both scientific literature and real-life monitoring of 20 elite-level Sambo athletes aged between 20 and 24, who underwent a planned 10-week training mesocycle. The sample was divided into two groups: the experimental group (n=10), which received carefully selected BAS protocols under medical supervision, and a control group (n=10), which relied exclusively on traditional recovery means (nutrition, sleep, massage, passive rest). The outcomes measured include perceived fatigue, muscular soreness, strength restoration (via control exercises), and physiological markers such as heart rate variability and creatine kinase levels. The implementation of the supplementation plan in the experimental group showed statistically and clinically significant improvement in recovery dynamics compared to the control group.

The selection of BAS was informed by evidence from sports medicine literature. Priority was given to those supplements with proven physiological mechanisms supporting recovery. These included whey protein isolate, BCAA (branched-chain amino acids), omega-3 polyunsaturated fatty acids, adaptogenic plant extracts such as Rhodiola rosea, and micronutrient complexes including magnesium, zinc, and vitamin D3. Whey protein was administered immediately after training sessions in doses of 25–30 g to promote muscle protein synthesis and reduce the catabolic window. BCAAs were taken pre- and intra-workout to reduce muscle breakdown, while omega-3 fatty acids were integrated daily at doses of 2 g EPA/DHA to reduce systemic inflammation and enhance neuromuscular coordination. Rhodiola rosea extract was included as an adaptogen known to modulate cortisol response and improve mental resilience in

fatigued athletes, while the multivitamin complex addressed minor deficiencies that often appear during periods of high load or restricted diet. All supplements were verified through certified anti-doping registries, ensuring safe application.

After 10 weeks, athletes from the experimental group reported not only lower scores of delayed onset muscle soreness (DOMS) but also a more stable mood and better sleep quality. On objective metrics, they demonstrated faster recovery of their 1RM bench press and squat indicators, while their creatine kinase levels remained within the upper physiological range, unlike in the control group, where levels peaked post-heavy load microcycles. The heart rate variability (RMSSD) scores, which reflect autonomic nervous system recovery, improved by an average of 16% in the supplement group compared to 5% in the control group. Subjective fatigue was rated on average 1.5 points lower on the Borg scale across comparable training weeks. These results indicate that biologically active supplements, when properly selected and administered, can have a direct impact on both subjective and biochemical recovery markers, and their inclusion in training support plans is well justified.

From a physiological standpoint, the benefits of BAS in Sambo athletes at the sports excellence stage stem from their specific adaptive needs. Unlike beginners, elite athletes often face plateau phases where traditional rest periods no longer suffice. Their metabolic rate is elevated, and the turnover of structural proteins is constant. This makes post-training protein availability crucial. Whey protein, as a fast-digesting, high-leucine content supplement, stimulates the mTOR pathway, promoting muscle fiber repair and hypertrophy. BCAAs, particularly leucine, isoleucine, and valine, further support this anabolic response and have been shown to reduce exercise-induced muscle damage in contact sport athletes. The use of omega-3 fatty acids, particularly EPA and DHA, has also garnered attention. These lipids reduce muscle soreness and systemic inflammation through downregulation of pro-inflammatory cytokines like IL-6 and TNF-α, and have also been shown to enhance neuromuscular transmission and recovery of muscle force. Such properties are particularly relevant for Sambo, where repeated explosive efforts are common and muscle-joint trauma is frequent.

Furthermore, recovery is not only about muscular repair but also the regulation of the stress-response axis. Here, adaptogens like Rhodiola rosea provide valuable effects. Their active compounds (rosavins and salidrosides) modulate the hypothalamic-pituitary-adrenal (HPA) axis and reduce cortisol levels, which are known to be elevated during periods of overtraining or psychological stress. By including Rhodiola in recovery protocols, athletes demonstrated improved HRV balance and reported reduced psychological fatigue. Sleep quality, tracked via athlete diaries and HRV nocturnal indices, also improved, contributing to better muscle regeneration and hormone stabilization. In addition, micronutrient repletion played a subtle yet crucial role. During intensified training, losses of magnesium and zinc through sweat can impair recovery and immune function. Supplementing these elements, along with vitamin D3

(which modulates immune and musculoskeletal systems), ensured that athletes remained healthy and injury-free throughout the mesocycle.

It is important to highlight that the application of BAS must be personalized and integrated into a larger training-recovery framework. Not all supplements are universally effective, and timing, dosage, and synergistic combinations matter. The effectiveness of BAS is also contingent on overall diet quality, hydration, and sleep hygiene. Thus, in the current study, supplements were not a substitute but a complement to optimized traditional recovery strategies. Their success was enhanced by educational sessions with athletes about the purpose and proper usage of each supplement, promoting adherence and avoiding self-medication. The sports medicine team played a pivotal role in monitoring biomarkers, adjusting protocols, and ensuring regulatory compliance.

Moreover, the use of supplements at this level must align with ethical and legal standards. The Sambo community, like other combat sports, adheres strictly to anti-doping codes, and even inadvertent violations through contaminated supplements can end careers. Therefore, only third-party certified supplements were used, with batch verification and documentation maintained. This precaution is not only procedural but also educational, as it instills in athletes a responsible approach to supplementation.

In conclusion, the present study reinforces the role of biologically active supplements as a viable and effective method to enhance recovery in Sambo athletes during the sports excellence stage. Their impact is seen across multiple domains—muscular, hormonal, neural, and psychological—and their proper application can contribute to higher training loads, better competition readiness, and longer career sustainability. While more randomized controlled trials are encouraged to deepen the evidence base, current practical findings suggest that BAS, when implemented professionally, can significantly advance recovery management in combat sports. Coaches, sports physicians, and athletes should consider BAS not as isolated “boosters” but as strategic tools within a comprehensive recovery plan, adjusted to the athlete’s training cycle, competition calendar, and individual physiological profile. Such an integrated approach ensures both high performance and athlete health — the two pillars of modern elite sport.

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