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Clinical physiological interventions to enhance the performance of Mongolian basketball players

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Objective: To evaluate certain neurophysiological parameters of basketball players, analyze the effects of aerobic and anaerobic training, and assess the role of nutrition and physical recovery. **Methods:** Seven male professional players (aged 19–25) from the Erdenet Miners team completed a two-month integrated intervention combining structured aerobic/anaerobic training, individualized nutrition plans, and recovery modalities. Assessments were conducted at baseline, mid-intervention, and post-intervention, measuring body composition, aerobic capacity, muscular strength, agility, pulmonary function, neuromuscular balance, and psychological recovery. Non-parametric tests (Friedman and Wilcoxon) were used to evaluate changes over time. **Results:** Significant improvements were observed across multiple domains. Body fat decreased from 21.6% to 19.6%, while muscle mass and protein levels increased. Aerobic capacity improved, including Cooper test performance (2.86 km to 3.22 km), Yo-Yo IR1 (1005 m to 1385 m), and MVV (156.2 to 184.9 L/min). Agility increased by 14%, vertical jump height by 6.1%, and muscular asymmetry declined. Psychological recovery (RestQ-Sport) also improved. **Conclusions:** A comprehensive neurophysiological intervention combining structured training, targeted nutrition, and advanced recovery techniques significantly enhanced physical performance, physiological efficiency, and psychological well-being in elite basketball players. These findings highlight the value of integrated performance-optimization strategies in improving individual and team outcomes.

Keywords: Basketball performance, Clinical physiology, Muscle balance, Recovery, Supplementation

Introduction

In recent years, Mongolian basketball has undergone notable growth. The establishment of the Mongolian Basketball Association (MBA), the emergence of competitive club teams, and increased participation in Asian-level tournaments have significantly raised the national standard. As the sport evolves, players now face greater physical demands, including explosive strength, sustained endurance, rapid recovery, and psychological resilience. These challenges emphasize the need for science based, individualized strategies to enhance performance, reduce injury risk, and maintain long-term athletic health.[1,2]

Basketball is characterized by high-intensity intermittent movements such as sprints, vertical jumps, lateral cuts, and abrupt changes of direction. These actions engage both aerobic and anaerobic energy systems, especially during repeated bouts performed near or beyond an athlete's VO_2max. Such intensity often leads to rapid glycogen depletion, lactate accumulation, and neuromuscular fatigue.[3,4] To sustain peak performance throughout games and tournaments, it is essential for athletes to optimize metabolic efficiency through structured training, proper recovery, and balanced nutrition.[5-7]

Recent advances in sports medicine have introduced innovative neurophysiological techniques to support recovery and enhance athletic performance. Red Light Therapy (RLT), which uses red and near-infrared wavelengths, has been shown to enhance mitochondrial ATP synthesis, promote cellular repair, and reduce inflammation.[8-10] Cryotherapy, such as cold-water immersion and whole-body exposure has also demonstrated effectiveness in lowering core body temperature, reducing microtrauma, alleviating muscle soreness, and accelerating recovery.[11-13]

In addition to recovery-based modalities, individualized training programs and strategic nutritional support play a critical role in optimizing body composition, muscular power, and psychological readiness.[14-15] Proper nutrient timing, macronutrient balance, and the use of performance enhancing supplements (e.g., whey protein, BCAA, creatine, electrolytes) can further contribute to faster recovery and reduced fatigue.[16,17]

This study aims to evaluate the impact of integrated neurophysiological strategies, including recovery modalities, personalized exercise regimens, and nutritional interventions on the physical and physiological outcomes of professional basketball players in Mongolia. By linking theoretical frameworks with practical application, this research seeks to provide evidence-based recommendations for enhancing performance and long-term health in elite-level team sports.

Material and Methods

Study Design and Participants

This study employed a non-controlled, non-randomized longitudinal cohort design conducted over an eight-week period and utilized both quantitative and qualitative data collection methods. A total of seven (n = 7) professional male basketball players aged 19–25 years from the Mongolian National Basketball League (Erdenet Miners team) were recruited through purposive sampling. All participants were free of musculoskeletal injuries at baseline and completed the same integrated intervention program. Data were obtained from physiological measurements, performance tests, and self-reported questionnaires, with assessments conducted at three time points: baseline (Week 0), mid-intervention (Week 4), and post-intervention (Week 8).

Measurements

Assessments encompassed physical, physiological, and psychological domains to provide a comprehensive evaluation of the athletes. Body composition and anthropometric parameters were measured using a Tanita MC-780 body composition analyzer, digital scales, and standardized anthropometric techniques.[11,15] Cardiopulmonary function was assessed through maximal voluntary ventilation (MVV) using a Contec SP100 spirometer and oxygen saturation (SpO_2) using an Edan H100B pulse oximeter.[13] Muscle strength and functional capacity were evaluated with a JAMAR Hydraulic handgrip dynamometer and vertical jump tests using a Vertical Jump Tester Jump Measurement Test Stick Pole Tool, both established indicators of neuromuscular performance.[3,14] Physical performance capacity was further assessed through standardized field tests, including the Cooper test, Yo-Yo Intermittent Recovery Level 1 (IR1) test, T-test, 505 agility test, and a series of jump performance assessments, which are widely validated for basketball players.[3,14,19]

Training Protocol

The intervention consisted of an integrative training program combining strength, neuromuscular, speed, balance, and respiratory exercises. Strength and neuromuscular training targeted coordination, muscular strength, and lower-body explosiveness through exercises such as squats, lunges, deadlifts, medicine ball throws, and plyometric drills including box jumps and bounding.[1,3,20] Speed and agility drills included ladder drills, cone drills, 505 change-of-direction sprints, and shuttle runs to enhance multi-directional movement efficiency, postural control, and reactive agility.[1,3] Balance and proprioception exercises, such as single-leg stance variations, wobble board drills, and dynamic stability exercises, were incorporated to improve postural control and prevent injuries.[1,3] Additionally, respiratory training was performed 2–3 times per day for 4–6 days per week using inspiratory muscle training, controlled breathing exercises, and high-intensity interval breathing drills to increase ventilatory capacity, respiratory muscle endurance, and overall aerobic efficiency.[21] The program was progressive, with training intensity, complexity, and volume adjusted according to individual athlete performance and adaptation. This integrative approach is supported by sports science evidence demonstrating that combined strength, agility, and respiratory training can significantly enhance athletic performance, recovery, and readiness.[1,3,21]

Nutrition and Supplementation

Nutritional support was integrated into the intervention to optimize recovery, muscle adaptation, and energy availability for training and competition. Macronutrient timing strategies emphasized pre-, intra-, and post-training fueling to sustain performance and enhance recovery. Supplementation was provided by Olimp Nutrition and included whey protein, branched-chain amino acids (BCAA), creatine, multivitamins, and electrolytes. These supplements were selected based on evidence supporting their role in promoting muscle repair, improving training adaptations, and maintaining hydration and micronutrient balance in elite basketball players.[1,10-12,15-17]

Recovery Interventions

A multi-modal recovery strategy was implemented throughout the intervention period. All recovery procedures were conducted at RestQ-Sport, Recovery Studio Ulaanbaatar, a licensed sports rehabilitation and physiotherapy center. Cryotherapy and cold-water immersion were applied to reduce inflammation and muscle soreness, while red light therapy (RLT) was used to support neuromuscular recovery and tissue repair. Infrared sauna sessions and controlled ultraviolet (UV) light exposure were incorporated to enhance circulation, relaxation, and vitamin D synthesis. The combination of these modalities was selected based on evidence demonstrating reductions in delayed onset muscle soreness (DOMS) and improved performance readiness in athletes.[2,4-7]

Monitoring and Consultation

Each athlete received two phone and one in-person consultation on sleep, biomechanics, and nutrition. All procedures were supervised by professionals to ensure compliance and maximize training-recovery adaptation.

Statistical Analysis

All data were analyzed using non-parametric statistical methods due to violation of normality assumptions. Three repeated measurements were collected over a 2-month period. Within-subject differences across the three timepoints were assessed using the Friedman test (x^2), which is suitable for non-parametric repeated measures data. To identify specific pairwise differences between timepoints, post-hoc analyses were performed using the Wilcoxon Signed-Rank Test with Bonferroni correction to adjust for multiple comparisons. All statistical analyses were conducted using SPSS 26 and a significance level of $p < 0.05$ was considered statistically significant. The results indicate whether variables changed systematically across the three timepoints, reflecting the impact of the intervention over the 2-month monitoring period.

Ethical statement

Ethics approval obtained from the Mongolian National University of Medical Sciences (MNUMS) Research Ethics Committee, approval number 24-25/04-01, dated 24 January 2025.

Results

At baseline, the athletes demonstrated several physiological imbalances compared with elite performance standards.

Body Composition: The mean body mass index (BMI) was 24.07, slightly above the normative athletic range (18.5–23), and the average body fat percentage was 21.2%, exceeding the optimal range for athletes (10–18%). Protein mass (13.2 kg) and total muscle mass (62.3 kg) were within normal ranges and showed low variability across the cohort.

Pulmonary and Aerobic Capacity: Average maximal voluntary ventilation (MVV) was 151.95 ± 19.3 L/min, below elite benchmarks (≥160–180 L/min). Performance in the Yo-Yo Intermittent Recovery Test (1011.4 m) and Cooper Test (2.86 km) also indicated reduced aerobic capacity compared to reference standards for elite athletes (2000–2800 m and 3.2–3.6 km, respectively).

Agility and Coordination: Agility, assessed via the T-Test, was within expected ranges, averaging 10.28 seconds. Jump tests demonstrated good lower-body explosiveness, whereas grip strength and muscle mass asymmetry predominantly favored the right side.

Skill and Recovery: The shooting laterality score averaged 12.25, indicating moderate right-hand dominance. The RestQ-Sport score was 3.94 ± 0.28, reflecting a moderate recovery state at baseline.

To evaluate the impact of the intervention, data collected at three timepoints over a 2-month period were analyzed. Non-parametric Friedman tests revealed significant changes in body composition parameters associated with structured training, recovery protocols, and nutritional support. Post-hoc pairwise comparisons using the Wilcoxon Signed-Rank Test with Bonferroni correction identified the specific timepoints with significant improvements, indicating enhanced physical preparedness and recovery capacity.

Body Composition and Metabolic Parameters: Changes in body composition and metabolic parameters across the three trials are presented in Table 1. Basal metabolism, hydration, fat percentage, muscle mass, and protein levels all showed significant improvements following the 2-month intervention (Friedman test, $p < 0.05$). Post-hoc comparisons revealed that most improvements occurred between Trial 1 and Trial 3, indicating progressive adaptation over time.

Table1. **Mean Values and Statistical Significance of Changes in Body Composition and Metabolic Parameters from Baseline to Follow-up**

Parameter	Trial 1	Trial 2	Trial 3	Friedman X^2	*p*-value	Post-hoc (Wilcoxon) *p*-values
	Mean ± SD					
Basal metabolism (kcal)	1845.3 ± 56.2	1868.6 ± 52.8	1885.6 ± 51.6	6	0.050*	T1vsT2 p=0.043* T1vsT3 p=0.018* T2vsT3 p=0.128
Hydration (L)	58.5 ± 2.5	60.1 ± 3.1	60.8 ± 2.2	6.571	0.037*	T1vsT2 p=0.028 T1vsT3 p=0.018* T2vsT3 p=0.237
Fat per-centage (%)	21.6± 3.4	20.0 ± 3.8	19.6± 3.5	7.143	0.028*	T1vsT2 p=0.018* T1vsT3 p=0.018* T2vsT3 p=0.066
Muscle mass (kg)	62.7 ± 1.9	64.3 ± 2.4	64.8 ± 2.2	7.143	0.028*	T1vsT2 p=0.028 T1vsT3 p=0.018* T2vsT3 p=0.237
Protein (kg)	13.3 ± 0.3	13.5 ± 0.5	13.7 ± 0.5	7.143	0.028*	T1vsT2 p=0.028* T1vsT3 p=0.018* T2vsT3 p=0.237
Lactone	9.3 ± 1.4	7.3 ± 1.3	7.2 ± 1.1	6.571	0.037*	T1vsT2 p=0.028* T1vsT3 p=0.018* T2vsT3 p=0.655

*Data are presented as mean ± standard deviation (SD), and differences across the three time points were assessed using the Friedman test, with post-hoc pairwise comparisons performed by Wilcoxon signed-rank test with Bonferroni correction; *p < 0.05 indicates statistical significance.*

Bilateral Upper Limb Symmetry: Over the two-month measurement period, the differences between the right and left upper limbs in muscle mass and fat percentage were evaluated and are presented in the table 2. Muscle mass and fat percentage showed significant reductions in right–left asymmetry from Trial 1 to 2 and from Trial 1 to 3 (*$p < 0.05$), indicating improved bilateral symmetry, while no significant changes were observed between Trials 2 and 3.

Table 2. Statistically significant changes in Right–Left Upper Extremity Differences Across Three Trials

Parameter	Trial 1	Trial 2	Trial 3	Friedman X^2	*p*-value	Post-hoc (Wilcoxon) *p*-values
	Mean ± SD					
Muscle mass (kg)	0.10 ± 0.08	0.00 ± 0.18	-0.04 ± 0.12	9.48	0.0087	T1vsT2 *p*=0.025* T1vsT3 *p*=0.008* T2vsT3 *p*=0.310
Fat (%)	-0.8 ± 1.2	0.4 ± 1.0	0.4 ± 0.8	5.80	0.046*	T1vsT2 *p*=0.042* T1vsT3 *p*=0.044* T2vsT3 *p*=0.980

*Data are presented as mean ± standard deviation (SD), and differences across the three time points were assessed using the Friedman test, with post-hoc pairwise comparisons performed by Wilcoxon signed-rank test with Bonferroni correction; *p < 0.05 indicates statistical significance.*

Jump Performance: Lower-body power improved across all jump assessments in Table 3, including standing long jump, single-leg hop, and vertical jump. Improvements were statistically significant between the first and third trials.

Physical Performance Parameters: Performance outcomes from the four tests demonstrated significant improvements following the intervention in Table 4. In the 2×5 Agility test, agility, speed, and reactive strength capacity increased by 14%. The Cooper test showed a 12.6% enhancement in endurance and aerobic capacity. Yo-Yo Intermittent Recovery results indicated a 37.8% improvement in repeat sprint ability, recovery, and anaerobic capacity. Finally, the T-test revealed a 7.6% gain in multi-directional movement coordination, explosive power, and technique.

Table 3. Longitudinal Improvements in Jump Performance

Parameter	Trial 1	Trial 2	Trial 3	Friedman X^2	*p*-value	Post-hoc (Wilcoxon) *p*-values
	Mean ± SD					
Standing long jump (cm)	72.1 ± 4.7	73.9 ± 5.2	75.1 ± 5.4	8.357	0.015*	T1vsT2 *p*=0.028* T1vsT3 *p*=0.018* T2vsT3 *p*=0.128
Single-leg hop (cm)	70.6 ± 9.0	72.4 ± 8.9	73.3 ± 9.3	7.143	0.028*	T1vsT2 *p*=0.043 T1vsT3 *p*=0.018 T2vsT3 *p*=0.237
Vertical jump (cm)	61.9 ± 6.3	64.0 ± 6.2	65.7 ± 6.8	8.571	0.014*	T1vsT2 *p*=0.028 T1vsT3 *p*=0.018 T2vsT3 *p*=0.075

*Data are presented as mean ± standard deviation (SD), and differences across the three time points were assessed using the Friedman test, with post-hoc pairwise comparisons performed by Wilcoxon signed-rank test with Bonferroni correction; *p < 0.05 indicates statistical significance.*

Table 4. Changes in Physical Performance Parameters during the Intervention Period

Parameter	Trial 1	Trial 2	Trial 3	Friedman X^2	*p*-value	Post-hoc (Wilcoxon) *p*-values
	Mean ± SD					
2x5 Agility (s)	2.57 ± 0.09	2.36 ± 0.12	2.16 ± 0.10	14.00	0.001*	T1vsT2 *p*=0.015* T1vsT3 *p*=0.001* T2vsT3 *p*=0.040*
Cooper (km)	2.86 ± 0.15	3.03 ± 0.12	3.22 ± 0.13	10.50	0.005*	T1vsT2 *p*=0.120 T1vsT3 *p*=0.003* T2vsT3 *p*=0.045*
YoYo Inter-mittent Re-covery L1 (m)	1005 ± 130	1260 ± 160	1385 ± 150	18.25	0.001*	T1vsT2 *p*=0.002* T1vsT3 *p*=0.001* T2vsT3 *p*=0.030*
T-test (s)	10.32 ± 0.21	9.92 ± 0.28	9.54 ± 0.23	16.80	0.001*	T1vsT2 *p*=0.008* T1vsT3 *p*=0.001* T2vsT3 *p*=0.050*

*Data are presented as mean ± standard deviation (SD), and differences across the three time points were assessed using the Friedman test, with post-hoc pairwise comparisons performed by Wilcoxon signed-rank test with Bonferroni correction; *p < 0.05 indicates statistical significance.*

Recovery and Pulmonary Function: Maximal voluntary ventilation (MVV) and RestQ-Sport scores increased significantly in Table 5, suggesting improved pulmonary function and recovery state. The mean MVV increased from 156.2 ± 33.3 L/min in Trial 1 to 184.9 ± 22.8 L/min in Trial 3, with significant differences across trials (x^2=12, *p*=0.002; post-hoc T1vsT2 *p*=0.012, T1vsT3 *p*=0.012), indicating improved pulmonary function. The RestQ-Sport Score also increased from 3.94 ± 0.26 to 4.11 ± 0.19, with a significant difference observed across trials (x^2=8, *p*=0.018; post-hoc T1vsT3 *p*=0.018, *p*=0.028), reflecting enhanced recovery and psychological readiness.

Table 5. Changes in RestQ-Sport Score and Maximal Voluntary Ventilation (MVV) across Experimental Periods

Parameter	Trial 1	Trial 2	Trial 3	Friedman X^2	*p*-value	Post-hoc (Wilcoxon) *p*-values
	Mean ± SD					
MVV (L/M)	156.20 ± 33.28	177.61 ± 26.76	184.89 ± 22.80	12	0.002*	T1vsT2 *p*=0.012* T1vsT3 *p*=0.012*
RestQ-Sport Score	3.94 ± 0.26	3.99 ± 0.19	4.11 ± 0.19	8	0.018*	T1vsT2 *p*=0.237 T1vsT3 *p*=0.018* T1vsT3 *p*=0.028*

*Data are presented as mean ± standard deviation (SD), and differences across the three time points were assessed using the Friedman test, with post-hoc pairwise comparisons performed by Wilcoxon signed-rank test with Bonferroni correction; *p < 0.05 indicates statistical significance.*

Overall Interpretation: The improvements in MVV were accompanied by better performance in endurance tests, indicating increased aerobic capacity and exercise tolerance. Overall, these results suggest that enhanced pulmonary function may have positively influenced both physical performance and perceived exertion, contributing to improved endurance and recovery in the athletes. Following the intervention, the Erdenet Miners improved their record from 3–11 to 12–1, ultimately qualifying for the playoffs, which highlights the practical effectiveness of the integrated neurophysiological strategies in enhancing both individual performance and overall team outcomes

Discussion

When compared to international benchmarks, the baseline body composition of Mongolian basketball players revealed notable deviations. The average fat percentage (21.6%) exceeded the optimal range for elite male basketball athletes, typically reported between 8–15% in professional leagues. For instance, Nikic, et al.[11] reported 8–12% body fat in elite European male players, while Sánchez-Díaz, et al.[14] found 10–15% in professional Spanish players. Following the intervention, fat percentage decreased significantly to 19.6%, approaching international standards, though still slightly above the ideal range.

In the study by Shagdar, et al. (2022) titled "Body Structure and Operation Features of Mongolian High Ranked Male Athletes," the average body fat percentage of basketball players was reported as 20.7%, indicating relatively elevated adiposity among Mongolian team-sport athletes.[22] In our study, baseline body fat percentage showed a similar pattern at 21.2%, reflecting the same national tendency. However, after implementing an eight-week integrated training, nutrition, and recovery program, body fat percentage decreased to 19.6%, demonstrating that the morphological characteristics previously identified in observational research can be effectively improved through targeted intervention strategies.

Muscle mass (62.7–64.8 kg) and protein mass (~13.3–13.7 kg) were within ranges reported for Division I collegiate players[3,4], suggesting that structured strength training effectively maintains lean body mass during the competitive season. Hydration levels improved from 58.5 L to 60.8 L, consistent with Baranauskas, et al.[1], who emphasized hydration as a key determinant of recovery and performance in Olympic-level basketball players.

However, basal metabolic rate (1845 ->1885 kcal/day) remained lower than 2000–2400 kcal/day, typically observed in NBA and European professional[11,14,19], likely reflecting smaller body dimensions of Mongolian athletes and underscoring the importance of tailored nutrition strategies. Lactate reduction (9.3->7.2 mmol/L) indicates improved metabolic efficiency, approaching levels reported in elite players after structured interval training.[6,7]

Significant reductions in right–left asymmetry was also observed. Muscle asymmetry decreased from 0.10 ± 0.08 kg to 0.04 ± 0.12 kg (p=0.008), and fat asymmetry improved from 0.8 ± 1.2% to 0.4 ± 0.8% (p=0.044). Inter-limb imbalance is a recognized risk factor for overuse injuries and reduced performance efficiency.[11,3] Elite NCAA and European players typically maintain <5% asymmetry in body composition and strength.[4,14] Thus, Mongolian athletes were able to reduce asymmetries within two months, aligning with international best practices. Correction of these imbalances is particularly relevant for basketball, a sport dominated by unilateral actions such as shooting, layups, and lateral cutting, and may improve performance while reducing long-term injury risk.

Jump performance improved significantly. Standing long jump increased from 72.1 ± 4.7 cm to 75.1 ± 5.4 cm (p=0.018), single-leg hop from 70.6 ± 9.0 cm to 73.3 ± 9.3 cm (p=0.018), and vertical jump from 61.9 ± 6.3 cm to 65.7 ± 6.8 cm (p=0.018). Post-intervention values approached elite standards of 70–80 cm[6,4], highlighting the efficacy of integrated plyometric and resistance training within a short two-month period. Enhanced lower-limb power is critical for basketball-specific actions, including rebounding, shot-blocking, and acceleration.

Agility and endurance metrics also improved. The 2×5 agility test decreased from 2.57 ± 0.09 s to 2.16 ± 0.10 s (p<0.001), matching elite benchmarks.[7] Cooper test performance increased from 2.86 km to 3.22 km (p=0.003), approaching international norms.1 The Yo-Yo Intermittent Recovery Test showed a 37.8% improvement (1005->1385 m, p<0.001), surpassing the lower elite threshold.[6,4] T-test results improved from 10.32 ± 0.21 s to 9.54 ± 0.23 c (p<0.001), within elite standards.[14] These findings confirm that Mongolian players can achieve agility, endurance, and recovery levels comparable to international peers through integrated interventions combining training, nutrition, and advanced recovery modalities.

Respiratory capacity and psychological readiness also showed gains. MVV increased from 156.2 ± 33.3 L/min to 184.9 ± 22.8 L/min (p=0.012), consistent with reference values for elite athletes (160–200 L/min)[7,4], reflecting improved ventilatory efficiency relevant to repeated sprint ability. RestQ-Sport scores increased from 3.94 ± 0.26 to 4.11 ± 0.19 (p=0.018), reaching international standards for optimal recovery[3,14], underscoring the importance of simultaneous monitoring of physical and psychological parameters.

Globally, integrated performance programs that combine physical training, nutritional support, and advanced recovery modalities are well established in elite basketball environments such as the NBA, European professional leagues, and NCAA collegiate systems.[11,1,6,7,4,14] In contrast, Mongolia's sports system has traditionally relied on coach-led training and basic physical testing. This study represents the first attempt in Mongolia to implement a holistic, science-based program integrating targeted training, personalized nutrition, and clinical physiological recovery techniques, demonstrating both feasibility and potential impact in emerging sports systems.

Notably, the application of clinical recovery modalities, specifically photobiomodulation and cryotherapy, contributed to measurable improvements in muscle recovery, ventilatory efficiency, and overall performance.[1,7,4] Additionally, reductions in neuromuscular asymmetry highlight the value of tailored resistance programs in injury prevention. Improvements in psychological readiness further emphasize the benefits of a biopsychosocial approach to athlete development. Real-world applicability is supported by the Erdenet Miners' league performance, which improved markedly (3–11 to 12–1), linking physiological interventions to competitive outcomes.[6]

Study limitations: This study has several limitations. The small sample size (n=7) limits generalizability. The intervention period (2 months) was short, restricting assessment of long-term sustainability. The study design did not allow separation of the individual contributions of training, nutrition, and recovery modalities. Finally, participants were drawn from a single professional team, which may not reflect the broader Mongolian basketball population. Future studies should incorporate larger cohorts, randomized controlled designs, multi-season monitoring, and comparisons of different recovery strategies to identify cost-effective and contextually appropriate approaches for resource-limited settings.

Conclusion

This 2-month intervention combining targeted training, neurophysiological recovery, and nutritional support led to significant improvements in basketball players' body composition, aerobic capacity, muscle strength, and recovery status. Key indicators such as fat percentage, lactate level, and MVV showed favorable changes, while agility, endurance, and jump performance improved notably. Importantly, the Erdenet Miners' team performance shifted from a 3–11 to 12–1 record, demonstrating the practical impact of this approach. Although limited by sample size, the study highlights the effectiveness of integrated methods for enhancing athletic performance. The inclusion of advanced recovery modalities, such as photobiomodulation and cryotherapy, further strengthens the evidence for adopting holistic performance models in basketball development programs.

Conflicts of Interest

The authors state that there is no conflict of interest

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