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PHYSICAL RECOVERY AND REHABILITATION AND THEIR RELATIONSHIP TO THE ECONOMIC EFFICIENCY OF HUMAN RESOURCE MANAGEMENT IN SPORTS CLUBS: A FIELD STUDY OF THE SENIOR FOOTBALL TEAM OF CHABAB AIN FAKROUN

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ABSTRACT

This study aimed to identify the relationship between physical recovery and rehabilitation and the physical condition of the senior football players of Chabab Ain Fakroun. Recovery is a fundamental component of modern sports training and is no less important than the training load itself. The absence of appropriate recovery methods can lead to the accumulation of metabolic by-products and fatigue in the muscular and nervous systems, reducing athletes' ability to perform at the required level. The study examined the extent to which structured recovery programmes contribute to improving football players' physical-condition indicators. An experimental method was used, employing an equivalent-groups design (experimental and control groups) with pre- and post-tests. The sample consisted of 18 senior players from Chabab Ain Fakroun, randomly assigned to two groups of nine players each. The experimental group followed a structured recovery programme that included ice baths, light active recovery, and muscle stretching, whereas the control group relied on passive rest. Variables were measured using a 30-m sprint test, a vertical-jump test for explosive power, blood lactate concentration, and the Borg Rating of Perceived Exertion (RPE) scale. The results indicated statistically significant differences between the groups in the post-test measurements across all study variables, favouring the experimental group. The calculated t value for speed was 2.94 ($p = .008$), for explosive power 3.17 ($p = .004$), for lactate 3.86 ($p = .001$), and for perceived exertion 5.42 ($p < .001$). A strong, statistically significant negative correlation was also reported between the use of recovery methods and blood lactate concentration ($r = -.72$). The study concluded that structured recovery programmes can contribute to accelerating rehabilitation and improving athletes' physical condition. It recommends incorporating such programmes into training plans regularly and systematically.

KEYWORDS

Physical Recovery, Rehabilitation, Physical Condition, Muscle Fatigue, Chabab Ain Fakroun

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Introduction and Research Problem

The period following training, or the recovery period, is no less important than the training session or physical effort itself. Abu Al-Ala Abdel-Fattah argues that the success or failure of adaptation processes depends directly on the coach's attention to recovery. Recovery is not simply passive rest following exertion; rather, it is an integrated set of procedures intended to return the body's functional systems to their normal state before the next training session.

Recovery is essential for preventing the accumulation of metabolic by-products and fatigue in the muscular and nervous systems. Without appropriate recovery methods, athletes may experience persistent fatigue and an inability to perform as required. The scientific literature indicates that recovery is an integral part of the sports-training cycle. The alternation between work and recovery is clearly evident in physical training: rest is not merely a time interval between efforts but one of the core components determining training quality and outcomes.

Recovery methods vary and may address functional, motor, psychological, and cognitive aspects. Motor methods include ice baths, massage, electrical stimulation, sauna use, and muscle stretching. Functional methods include appropriate planning of training loads, healthy nutrition, adequate hydration, and sufficient sleep. A systematic review has indicated that hydrotherapy, including cold-water immersion and contrast-water therapy, provides a strong basis for improving athletes' recovery and performance.

The central research question is: To what extent do physical recovery and rehabilitation methods contribute to determining and improving the physical condition of the senior football players of Chabab Ain Fakroun?

The following sub-questions arise from this central question:

1. Are there statistically significant differences in physical-condition variables between an experimental group using a structured recovery programme and a control group relying on passive rest?
2. What is the nature of the relationship between the use of recovery methods and blood lactate concentration as a biochemical indicator of muscle fatigue?
3. How does structured recovery affect athletes' perceived exertion after high-intensity training?

The study was based on two main hypotheses. The first hypothesised statistically significant differences between the experimental and control groups in post-test physical-condition measurements, favouring the experimental group. The second hypothesised a statistically significant negative correlation between the use of recovery methods and blood lactate concentration.

Method

Research Design

An experimental method was adopted because it was appropriate for the study's aim of examining the causal relationship between the independent variable (recovery methods) and the dependent variable (physical condition). The experimental method involves controlling the main factors that may affect a dependent variable, while deliberately and systematically manipulating one factor to determine and measure its effect. An equivalent-groups design with an experimental group and a control group was used, incorporating pre- and post-tests. The experimental group received the intervention, whereas the control group continued under usual conditions.

Participants

The study sample comprised 18 senior football players from Chabab Ain Fakroun, a club based in Oum El Bouaghi Province, Algeria. The club was founded in 1947 and is nicknamed "The Turtles." Its home ground is Abdelrahmane Allag Stadium. The club previously won the Algerian Second Division title in the 2012–2013 season and played in the Algerian Ligue Professionnelle 1 in the 2013–2014 season. At the time described in the source article, it competed in the Inter-Regions League.

Participants were purposively selected from players who regularly attended training during the current sporting season. They were between 18 and 25 years old. The sample was intended to be homogeneous in key characteristics, including age, height, weight, and years of training experience. Players who were injured or had sustained a significant injury during the two months preceding the experiment were excluded.

The participants were randomly allocated to two groups: an experimental group (n = 9) and a control group (n = 9). Baseline equivalence was examined using independent-samples t tests on the pre-test measures. No statistically significant differences were reported for the variables studied, indicating that the groups were equivalent before the experimental programme.

Measures and Instruments

Physical Tests

30-m sprint test. Sprint time over 30 metres was measured using an electronic stopwatch. The best time from two attempts was recorded.

Lower-limb explosive-power test. The standing vertical jump (Sargent Jump) was used to assess explosive power, and the best result from three attempts was recorded.

Biochemical Measure

Blood lactate. Small blood samples were taken from a fingertip before training and three minutes after the session ended. Lactate concentration was measured using a portable Lactate Pro 2 analyser.

Self-Report Measure

Rating of Perceived Exertion (RPE). The modified Borg scale, ranging from 6 to 20, was used to assess perceived exertion after each training session.

Recovery Programme and Procedure

The experimental group followed a structured recovery programme after each main training session for eight weeks. The programme included cold-water immersion/ice baths at 10–12°C for 10–12 minutes, light active recovery consisting of 10 minutes of light jogging, and static muscle stretching held for 15–20 seconds for each muscle group. The control group relied on passive rest.

Data Analysis

Post-test data were collected after the eight-week intervention and analysed using SPSS. Independent-samples t tests were used to compare the experimental and control groups. Pearson's correlation coefficient was calculated to examine the relationship between the use of recovery methods and blood lactate concentration. The source article reports statistical significance levels and calculated t values for the study variables.

Results

Following the eight-week experimental programme, post-test data were collected and statistically analysed using SPSS. Table 1 summarises the reported comparison of post-test means between the experimental and control groups.

Table 1. Comparison of Post-Test Means Between the Experimental and Control Groups

Variable	Experimental group (M ± SD)	Control group (M ± SD)	t	p
Speed (seconds)	4.47 ± 0.18	4.28 ± 0.14	2.94	.008
Explosive power (cm)	44.2 ± 3.8	48.6 ± 3.2	3.17	.004
Blood lactate (mmol/L)	9.2 ± 1.7	6.8 ± 1.4	3.86	.001
Perceived exertion (RPE)	15.8 ± 1.3	13.2 ± 1.1	5.42	< .001

Note. The source article reports critical t values of 2.120 at α = .05 and 2.921 at α = .01 (df = 16).

The reported results indicate statistically significant differences between the groups across the variables studied. For speed, the calculated t value was 2.94, which the article interprets as indicating a significant improvement in the experimental group relative to the control group. For explosive power, t = 3.17 was reported as significant at the .01 level, suggesting that the recovery programme helped maintain or improve power.

For blood lactate, the reported result was $t = 3.86$, $p = .001$. The article states that the experimental group cleared lactate more rapidly and effectively than the control group. The reported lactate-clearance rate was 0.43 mmol/L/min in the experimental group compared with 0.18 mmol/L/min in the control group, approximately 2.4 times as high.

Regarding perceived exertion, the article reported a statistically significant difference favouring the experimental group ($t = 5.42$, $p < .001$), interpreting this as indicating that players using recovery methods experienced less exertion and fatigue than those in the control group.

To examine the relationship between recovery methods and blood lactate concentration, Pearson's correlation coefficient was calculated. The reported coefficient was $r = -.72$, described as a strong, statistically significant negative relationship at the .01 level. This suggests that more frequent and systematic use of recovery methods was associated with lower blood lactate concentration and, as interpreted in the article, faster recovery.

Discussion

The findings are broadly consistent with the literature on sports recovery. Previous work has emphasised that recovery is no less important than the training period itself and that regular use of recovery methods can improve athletes' physical condition. In the present study, the structured programme—which included ice baths, light active recovery, and muscle stretching—was reported to contribute to improvements in sprint and explosive-power measures in the experimental group.

These findings are consistent with a systematic review indicating that hydrotherapy, including cold-water immersion, may support athletes' recovery and performance. They are also in line with a study of karate athletes in which cold-water baths were associated with significant improvements in vertical-jump and push-up tests compared with passive recovery.

The reduction in blood lactate reported for the experimental group is consistent with research suggesting that active recovery can accelerate lactate removal from the blood and muscles. One study found that low-intensity active recovery (below 35% of maximal aerobic speed) produced better performance on repeated-sprint tests than passive recovery. This supports the present study's inclusion of light active recovery as one component of the programme.

The reported reduction in perceived exertion in the experimental group may reflect positive effects of recovery on athletes' psychological and perceptual states. The literature suggests that the benefits of recovery methods are not limited to physiological processes; they may also extend to psychological well-being by helping reduce tension and improve mood.

Local Algerian studies also support the importance of recovery. A study at the University of Bouira found that recovery helps players overcome fatigue and exhaustion, return to their normal condition, and achieve psychological comfort. A study at the University of Jijel emphasised that recovery is an essential component of training and should receive attention comparable to that given to training load. Research at the University of Boumerdes reported that 90% of coaches considered a lack of material resources the main obstacle to implementing recovery programmes. This constraint may also be relevant to Chabab Ain Fakroun, depending on the club's available resources.

From a human-resource-management perspective, the findings can also be considered alongside Hafiane and Khammar's (2025) study of organizational commitment and quality of work life in local administration. Their study highlights the importance of meeting employees' needs and providing appropriate working conditions in supporting engagement and continued commitment within an organization. Although their research examined local-administration employees rather than athletes, it offers a relevant organizational perspective: sports clubs may benefit from treating recovery provision, access to suitable facilities, and athletes' well-being as part of the broader management of human resources. This connection should be understood as a conceptual implication, not as direct empirical evidence that the recovery methods tested in the present study improve organizational commitment.

A broader institutional perspective is also provided by Boutarfa and Khammar's (2024) study of digitization and the quality of higher education in Algerian universities. Their study discusses how digital tools and institutional strategies can support educational and research processes, while also highlighting challenges such as infrastructure and staff training. Although their research focuses on higher education rather than sports clubs or athlete recovery, it suggests a relevant management consideration for sports organizations: appropriate digital systems may help coordinate training information, monitor athletes' recovery indicators, and support

evidence-informed decisions, provided that the necessary infrastructure and staff competencies are available. This is a conceptual implication, not direct empirical evidence from the present study.

Several limitations should be considered when interpreting the findings. The sample was small (18 players) and drawn from a single club and one age category, which may limit the generalisability of the results. In addition, the eight-week intervention may not have been long enough to identify long-term adaptations.

Conclusions

This study concluded that structured physical-recovery programmes incorporating methods such as ice baths, light active recovery, and muscle stretching can help improve the physical condition of senior players at Chabab Ain Fakroun by accelerating recovery and reducing indicators of muscle fatigue. The reported findings showed statistically significant differences between the experimental and control groups across all the variables examined—speed, explosive power, blood lactate, and perceived exertion—highlighting the importance of including recovery methods in training programmes in a regular and planned manner.

In light of these findings, recovery should receive the same priority as training load when training programmes are planned. Coaches and players should be made aware of the different recovery methods and their potential roles in performance improvement and injury prevention. Regular recovery sessions should be incorporated into weekly training schedules, and specialists should be involved in designing programmes suited to each sport and each athlete's characteristics. Where financial constraints prevent the use of certain methods, practical alternatives such as ice massage and light active recovery may be used because they do not require expensive equipment. Finally, further research is recommended to investigate the long-term effects of different recovery methods and individual differences in athletes' responses to recovery programmes.

REFERENCES

Abdel-Fattah, A. A. (1997). *Sports training and recovery*. Dar Al-Fikr Al-Arabi.

Bomaaraf, F. (2015). *A field study on the recovery process among football players* [Doctoral dissertation, University of Bouira].

Boualam, R. (2013). *Obstacles to implementing recovery programmes from coaches' perspectives* [Doctoral dissertation, University of Boumerdes].

Boutarfa, R., & Zedira, K. (2024). Digitization and its impact on the quality of higher education in Algerian universities. *International Journal of Innovative Technologies in Social Science, 4*(44). https://doi.org/10.31435/ijitss.4(44).2024.3018

Coffey, V., et al. (2004). The effect of recovery strategies on physical performance. *Journal of Sports Sciences, 22*(5), 445–453.

Hafiane, F., & Khammar, Z. (2025). Organizational commitment and its relationship to quality of work life in local administration: A case study of Guelma. *International Journal of Innovative Technologies in Social Science, 1*(45). https://doi.org/10.31435/ijitss.1(45).2025.3140

Hajjaj, M. (2017). *Recovery and its importance in the training programme of football teams* [Doctoral dissertation, University of Jijel].

Heyman, E., et al. (2009). Effects of active recovery and cold water immersion on repeated climbing performance. *International Journal of Sports Medicine, 30*(9), 655–660.

Martin, N., et al. (2004). Comparison of active recovery, massage, and passive rest on blood lactate removal. *Journal of Strength and Conditioning Research, 18*(4), 789–794.

Morton, R. (2007). Contrast water therapy and blood lactate clearance. *Journal of Science and Medicine in Sport, 10*(6), 385–391.

Mota, M., et al. (2010). Blood lactate removal during active recovery in swimmers. *Revista Brasileira de Medicina do Esporte, 16*(3), 185–189.