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Association between Recovery Status and Performance among Male Players in the Northwest Regional Football League of Cameroon

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ABSTRACT

This study examined the association between recovery status and performance among male players in the Northwest Regional Football League of Cameroon. The study addressed the second objective of a broader investigation of training adaptations and player performance and combined quantitative and qualitative evidence. An explanatory sequential mixed-methods design was used. The sampling frame comprised 30 teams organised into four pools; two pools were selected by ballot, two teams were purposively selected from each selected pool, and all eligible players in the four participating teams were enumerated. The quantitative sample comprised 114 male players from Rising Star FA (n=25), SAMISA FA (n=31), SIMAF FA (n=23), and ACHICO FA (n=35), while four head coaches participated in semi-structured interviews. Recovery status was assessed with the Hooper Recovery Index, covering sleep quality, fatigue, stress and muscle soreness, and performance was assessed using the performance measures adopted in the broader study. Quantitative data were analysed with frequencies, percentages, means, standard deviations, Pearson product-moment correlation and simple linear regression; coach interviews were analysed thematically. The overall Hooper Index was 12.82 ± 7.69. Although 49.1% of players were classified as having excellent recovery, 49.2% were classified as having poor or very poor recovery and 1.7% having good, demonstrating substantial inter-individual variation. Recovery status was significantly and inversely associated with performance ($r = -.624$, $p < .001$). The regression model was statistically significant, $F(1,112) = 71.49$, $p < .001$, and recovery status accounted for 39.0% of the observed variance in performance ($R^2 = .390$; adjusted $R^2 = .384$). Coach interviews indicated that rest, sleep, hydration, nutrition, stretching and light recovery activities were commonly used, whereas formal recovery programmes and advanced modalities were limited. The findings indicate that poorer recovery status is associated with lower player performance in this regional football context. However, because recovery interventions were not experimentally assigned and players were nested within four teams, the findings were interpreted as associational and predictive

rather than causal. Routine monitoring of sleep, fatigue, stress and muscle soreness, combined with context-appropriate recovery planning, may assist coaches in managing player readiness.

Keywords:

Recovery status; Hooper Index; performance; wellness; fatigue; Northwest Regional Football League; Cameroon.

1. Introduction

Football performance emerges from the interaction of physical, technical, tactical and psychological capacities. Training and match play expose players to repeated physiological and psychological stress, and recovery is required to restore functional capacity and permit adaptation. In football, post-match fatigue can involve changes in neuromuscular function, muscle damage, substrate availability, hydration status, perceived wellness and psychological readiness, and these processes recover at different rates [1,2]. Recovery should therefore be understood as a multidimensional component of training rather than simply an activity performed after exercise.

Contemporary sport science emphasises monitoring the interaction between training load, fatigue, recovery and performance. Training-load monitoring can assist coaches in identifying whether athletes are adapting to a programme and can help detect meaningful changes in fatigue and readiness; however, no single monitoring marker captures the complete state of an athlete [3]. Wellness measures such as sleep quality, fatigue, stress and muscle soreness provide relatively accessible information about perceived readiness and are particularly useful where sophisticated physiological or technological monitoring is unavailable. The Hooper Index was developed as a practical monitoring approach based on these four domains [4].

Evidence from football also indicates that recovery is influenced by the timing and nature of training and competition. Nédélec et al. [1,2] described recovery after soccer match play as a complex process affected by the magnitude of match demands and individual characteristics. A systematic review and meta-analysis by Altarriba-Bartes et al. [5] found that post-competition recovery strategies can improve selected outcomes, but effects differ according to the recovery intervention and performance measure. A later evidence-based review likewise emphasised that recovery strategies should be appropriately selected and timed rather than assumed to be universally beneficial [6]. These findings support a monitoring-oriented approach in which recovery status is assessed alongside the practical recovery environment.

Recent soccer research provides further evidence that wellness and training or match demands are related. Oliveira et al. [7], for example, reported relationships between wellness measures and training/match intensity in professional male soccer players, including lower wellness following demanding match exposure. However, much of the published evidence comes from professional or highly resourced football environments. Less is known about recovery status and performance among players in regional and semi-professional football systems where access to sports-science personnel, monitoring technology and specialised recovery facilities may be constrained.

The Northwest Regional Football League of Cameroon provides an important context for examining this issue. The broader thesis from which this article was derived identified variation in recovery practices among the participating teams and reported that coaches commonly relied on accessible strategies such as rest, sleep, hydration, stretching, nutrition and light recovery activity. The study therefore addresses a contextual evidence gap by examining whether differences in players' perceived recovery status are statistically associated with differences in performance among male players competing in the regional league.

The specific objective of this article was to investigate the relationship between recovery status and performance among male players in the Northwest Regional Football League of Cameroon. The research question was: What relationship exists between recovery status and performance among male players in the Northwest Regional Football League of Cameroon? The null hypothesis stated that there is no statistically significant relationship between recovery status and player performance.

2. Materials and Methods

2.1 Research Design

An explanatory sequential mixed-methods design was employed. The quantitative component established the magnitude and direction of the relationship between recovery status and performance, while the qualitative component subsequently provided contextual information about recovery practices used by participating coaches. For the specific recovery-performance analysis, the quantitative component was observational at the measurement point: players were not experimentally assigned to different recovery interventions. Accordingly, the statistical findings are interpreted as associations and predictive relationships rather than definitive causal effects.

The study was conducted among male players participating in the Northwest Regional Football League of Cameroon. Four teams (Rising Star FA, SAMISA FA, SIMAF FA and ACHICO FA) participated in the recovery component. The research was conducted within the practical conditions of regional football, where access to specialised sports-science support and advanced monitoring technologies was limited.

2.2 Population, Sampling and Participants

The sampling frame comprised 30 teams organised into four competitive pools. Teams were treated as the primary sampling units because players were organised and trained within team environments. A multistage sampling procedure was used. First, two of the four pools were selected by ballot. Second, two teams were purposively selected from each selected pool on the basis of accessibility, availability, willingness to participate and access to the training environment. Third, all eligible players within the four selected teams were included through total enumeration. This approach produced a quantitative sample of 114 players rather than a separately calculated subsample of individuals.

Participating team	Players (n)	Coach (n)
Rising Star FA	25	1
SAMISA FA	31	1
SIMAF FA	23	1
ACHICO FA	35	1
Total	114	4

Table 1. Distribution of participants by participating team.

2.3 Instruments and Measures

2.3.1 Hooper Recovery Index

Recovery status was assessed with the Hooper Recovery Index. The instrument contains four subjective wellness domains: sleep quality, fatigue, stress and muscle soreness/DOMS. Each domain was rated on the adopted 1–7 scale and the four ratings were summed to produce a total score ranging from 4 to 28. Lower scores indicate more favourable recovery/wellness, whereas higher scores indicate poorer recovery. The study adopted the following classification: 4–8 excellent, 9–12 good, 13–16 moderate, 17–20 poor, and 21–28 very poor/high fatigue risk.

The instrument was selected because it is brief, inexpensive and feasible for repeated use in football environments where laboratory assessment and advanced monitoring technologies may be limited. Hooper and Mackinnon [4] identified subjective wellness monitoring as a practical component of athlete monitoring, while subsequent football literature has continued to use wellness variables to examine readiness and fatigue [2,7].

2.3.2 Player Performance

Player performance was the dependent variable. In the broader study, performance was operationalised using physical, technical, tactical and competitive indicators. Competitive records included games played, wins, draws, losses, goals scored, goals conceded, goal difference and total points. The article uses the performance score generated within the broader study rather than introducing a new performance metric, thereby maintaining consistency with the thesis analysis.

2.3.3 Coach Interviews

A semi-structured interview guide was used with one head coach from each participating team. Questions addressed commonly used recovery practices, availability of recovery facilities, player education, perceived effectiveness of recovery practices, and persistent fatigue or injury concerns. The interviews were intended to contextualise the quantitative findings rather than to serve as a second quantitative measure of recovery.

2.4 Validity, Reliability and Trustworthiness

The instruments were aligned with the study objectives and conceptual framework. The thesis reports face, content and construct validity procedures, including expert review of researcher-developed components and correspondence between each instrument and the construct it was intended to measure. A pilot test was conducted among 30 male football players outside the main study population. The pilot produced heterogeneous internal-consistency coefficients for the questionnaire components, including $\alpha = -.171$ for the four Hooper-type items. Because the four Hooper indicators represent distinct wellness domains rather than interchangeable items of a single latent trait, the main analysis treated the four domains as components of the established Hooper Index rather than interpreting the pilot alpha as evidence for a unidimensional scale. This decision is consistent with the conceptual use of the Hooper Index as a multidimensional wellness monitoring measure.

The coach interview guide was not assessed with Cronbach's alpha because interview questions were not intended to form a homogeneous psychometric scale. Trustworthiness was supported through standardised administration, consistent questioning and systematic coding. Objective performance tests in the broader thesis were likewise not subjected to Cronbach's alpha because they represented different physical constructs and measurement units.

2.5 Data Collection and Ethics

Administrative access was obtained from the relevant football authorities and participating team management. Players and coaches were informed about the purpose and procedures of the study, participation was voluntary, and confidentiality was maintained through coded data and aggregate reporting. The thesis reports institutional ethical approval and organisational permission. Participants were informed of their right to withdraw without negative consequences, and physical assessments in the broader study were conducted using standard safety procedures.

2.6 Data Analysis

Quantitative data were analysed using the Statistical Package for the Social Sciences (SPSS). Frequencies,

percentages, means and standard deviations described recovery status and performance. Pearson's product-moment correlation coefficient was used to determine the direction and magnitude of the relationship between the total Hooper Index and performance. Simple linear regression was then used to estimate the predictive contribution of recovery status to performance. The model was evaluated using R, R^2, adjusted R^2, standard error of estimate (SEE), F, regression coefficient B, standardised beta, t, 95% confidence interval and Durbin-Watson statistic. Statistical significance was evaluated at $\alpha = .05$. Because higher Hooper scores represent poorer recovery, negative correlation and regression coefficients indicate that poorer recovery is associated with lower performance.

Interview transcripts were reviewed, coded and grouped into themes concerning recovery practices, monitoring, player education, recovery resources and fatigue-related concerns. The qualitative findings were integrated with the quantitative results at the interpretation stage to explain the practical context surrounding the observed statistical relationship.

3. Results

3.1 Recovery Status of the Players

Recovery category	Hooper score	N	%
Excellent	4–8	56	49.1
Good	9–12	0	0.0
Moderate	13–16	2	1.7
Poor	17–20	24	21.2
Very poor/high fatigue risk	21–28	32	28.0
Total	4–28	114	100.0

Table 2. Distribution of players according to Hooper Recovery Index.

The overall Hooper Index was 12.82 ± 7.69. At the component level, sleep quality had a mean of 3.18 ± 1.97, fatigue 3.22 ± 2.00, stress 3.18 ± 2.00, and muscle soreness 3.24 ± 1.90. Thus, the sample mean was close to the upper boundary of the good-recovery category, while the relatively large standard deviation indicated substantial individual variation. Fifty-six players (49.1%) were classified as having excellent recovery, two (1.7%) as moderate, 24 (21.1%) as poor, and 32 (28.1%) as very poor/high fatigue risk. Consequently, 56 players, representing 49.2% of the sample, were classified as having poor or very poor recovery.

3.2 Recovery Status and Performance by Team

Team	N	Hooper M	Hooper SD	Recovery status	Performance M ± SD
Rising Star FA	25	5.28	0.84	Excellent	213.11 ± 3.48
SAMISA FA	31	5.19	0.65	Excellent	140.21 ± 4.40
SIMAF FA	23	17.65	1.03	Poor	99.85 ± 3.63
ACHICO FA	35	21.80	1.08	Very poor	130.92 ± 3.09
Overall	114	12.82	7.69	—	151.38 ± 42.17

Table 3. Recovery status and performance by participating team.

Rising Star FA recorded the lowest mean Hooper score (5.28 ± 0.84) and the highest mean performance score (213.11 ± 3.48). SAMISA FA also recorded an excellent mean recovery profile (5.19 ± 0.65). SIMAF FA recorded a poor recovery profile (17.65 ± 1.03), while ACHICO FA recorded a very poor profile (21.80 ± 1.08). These team-level descriptive differences are consistent with an association between recovery status and performance, but they also show that the relationship is not perfectly linear across teams; for example, ACHICO's mean performance exceeded SIMAF's despite a poorer recovery profile. This reinforces the multifactorial nature of football performance.

3.3 Correlation between Recovery Status and Performance

Pearson's product-moment correlation showed a statistically significant inverse relationship between Hooper Recovery Index scores and performance, $r = -.624$, $p < .001$. Because higher Hooper scores indicate poorer recovery, the coefficient indicates that poorer recovery status was associated with lower performance. The magnitude of the correlation indicates a substantial relationship within the observed sample.

3.4 Regression Analysis

R	R^2	Adjusted R^2	SEE	F(1,112)	P
.624	.390	.384	33.01	71.49	< .001

Table 4. Simple linear regression model predicting performance from recovery status.

The regression model was statistically significant, $F(1,112) = 71.49$, $p < .001$, and explained 39.0% of the observed variance in performance ($R^2 = .390$; adjusted $R^2 = .384$). The standard error of estimate was 33.01 and the Durbin-Watson statistic was 1.826. The regression coefficient for recovery status was $B = -3.168$ ($SE = 0.375$), $\beta = -.624$, $t = -8.455$, $p < .001$, with a 95% confidence interval from −3.911 to −2.426. Accordingly, a one-unit increase in the Hooper score was associated with an estimated 3.168-unit decrease in the predicted performance score. The result provides statistical evidence against the null hypothesis of no association. It does not, however, establish that a particular recovery strategy caused the change in performance.

3.5 Qualitative Findings

Theme	Summary of coach reports
Common recovery practices	Rest, sleep, hydration, stretching, nutrition and light recovery exercise.
Formal/advanced recovery	Formal programmes and advanced modalities were limited.
Player education	Team discussions, reminders and occasional individual advice were used.
Fatigue and readiness	Coaches reported persistent fatigue and occasional injury concerns during demanding periods.
Monitoring	Recovery monitoring was mainly practical and observational rather than technology-intensive.

Table 5. Themes from interviews with the four participating coaches.

The qualitative findings complemented the statistical results. Coaches described recovery as an important part of maintaining readiness but reported reliance on relatively accessible practices. Rest, sleep and hydration were commonly mentioned, with stretching, nutrition and light recovery activities also used.

Coaches reported that formal recovery programmes and advanced modalities were uncommon, and that player education was frequently delivered through team discussions, reminders and individual advice. The interview evidence therefore provides contextual support for the importance of systematic recovery monitoring while also illustrating the resource conditions under which recovery decisions were made.

4. Discussion

The principal finding was a statistically significant inverse association between recovery status and performance. The correlation of $r = -.624$ and the regression result showing $R^2 = .390$ indicate that recovery status was substantially related to performance in the observed sample. Because the Hooper Index is coded so that higher values represent poorer wellness, the direction of the relationship indicates that players reporting poorer recovery tended to have lower performance scores. This finding is consistent with the broader theoretical proposition that training adaptation depends on an appropriate balance between stress and recovery rather than training stimulus alone.

The result is consistent with the established literature on soccer recovery. Nédélec et al. [1,2] describe match-induced fatigue as multidimensional, involving physiological, neuromuscular, metabolic and psychological components that may recover at different rates. Inadequate recovery can therefore leave players entering subsequent training or competition with residual fatigue. Kellmann et al. [8] similarly conceptualised recovery as an active process of restoring psychological and physiological resources and emphasised the importance of balancing stress and recovery when managing athletes.

The present finding also corresponds with recent empirical evidence linking wellness and football load. Oliveira et al. [7] found relationships between daily wellness measures and training or match intensity in professional male soccer players, with demanding match exposure associated with poorer next-day wellness indicators. Although that study involved a much smaller professional sample and repeated monitoring across a microcycle, its findings support the general proposition that perceived wellness and football demands are interconnected. The present study extends this line of evidence to a regional Cameroonian football context with substantially fewer resources for formal monitoring.

The distribution of recovery scores is especially important. The sample mean of 12.82 could be interpreted as generally favourable because it lies at the upper boundary of the adopted good-recovery category. However, the frequency distribution shows that almost half of the players were classified as poor or very poor. This demonstrates why aggregate means can conceal meaningful individual differences. Players training within the same team may differ in sleep, perceived fatigue, stress and muscle soreness because of differences in playing exposure, lifestyle, travel, academic or occupational demands and individual response to training.

The team-level descriptive results further demonstrate that recovery cannot be treated as the sole determinant of football performance. Rising Star FA combined the most favourable recovery profile with the highest mean performance score, while SIMAF FA showed poor recovery and the lowest mean performance score. However, ACHICO FA had poorer recovery than SIMAF FA but a higher mean performance score, and SAMISA FA had a recovery profile similar to Rising Star FA but a substantially lower mean performance score. These differences are compatible with the view that performance is multifactorial and also depends on technical quality, tactical organisation, fitness, coaching, team cohesion, opposition, competitive experience and other contextual variables.

The qualitative findings provide a practical explanation for the observed variability. Coaches reported using rest, sleep, hydration, nutrition, stretching and light recovery activities, all of which are recognised components of football recovery practice [2,5,6]. At the same time, the limited availability of formal

programmes and advanced recovery modalities indicates that recovery management in this setting is largely dependent on low-cost behavioural practices and coach observation. This is important because evidence does not support the assumption that every advanced recovery modality will produce the same benefit across all performance outcomes. Altarriba-Bartes et al. [5] reported beneficial effects for some post-competition recovery outcomes but not uniformly across sprint, maximal strength and other measures, while Haller et al. [6] emphasised evidence-based selection and appropriate timing of recovery practices.

The finding that recovery status explained 39.0% of the observed variance should also be interpreted carefully. The R^2 statistic describes the proportion of variation in this dataset accounted for by the single predictor; it does not mean that recovery status is responsible for 39% of performance in a causal sense. Approximately 61% of the observed variance remained outside the model. Moreover, players were clustered within four teams and shared training environments, while the regression model did not simultaneously control for training load, playing position, fitness, injury status, coaching factors, competitive exposure or other determinants of performance.

The measurement approach also has implications for interpretation. The Hooper Index is a subjective wellness measure rather than a direct physiological biomarker. Subjective measures can be useful because they capture the athlete's perception of sleep, fatigue, stress and soreness, but they are influenced by context and reporting behaviour. Halson [3] therefore recommends individualised monitoring and cautions against reliance on a single marker. The present study supports that principle: the substantial dispersion of Hooper scores suggests that coaches should examine individual recovery profiles rather than relying only on team averages.

Taken together, the quantitative and qualitative evidence supports a practical model in which recovery monitoring is incorporated into routine training decisions. In a resource-constrained regional league, this does not necessarily require expensive technology. A brief pre-training wellness check covering sleep, fatigue, stress and muscle soreness can provide a repeatable indicator of perceived readiness. When elevated scores persist, coaches can consider appropriate modifications to training volume or intensity, additional rest, lighter sessions or other context-appropriate recovery measures. Such decisions should be based on trends and the broader training context rather than a single isolated score.

5. Conclusions

Recovery status was significantly and inversely associated with performance among male players in the Northwest Regional Football League of Cameroon. Nearly half of the players were classified as having poor or very poor recovery, despite the overall mean Hooper score falling near the favourable end of the adopted scale. The correlation and regression results indicate that poorer perceived recovery was associated with lower performance and that recovery status accounted for 39.0% of the observed variance in performance in the single-predictor model. Coach interviews indicated that teams mainly relied on accessible practices such as rest, sleep, hydration, nutrition, stretching and light recovery activity, while formal and advanced recovery programmes were limited. The evidence supports systematic, individualised and context-appropriate monitoring of recovery in regional football. Because the study was observational and players were clustered within four teams, the results should be interpreted as evidence of association and statistical prediction rather than definitive causal effects of recovery interventions.

6. Practical Implications

Coaches should consider implementing a brief routine monitoring procedure based on sleep quality, fatigue, stress and muscle soreness. Monitoring should be interpreted longitudinally where possible, with attention to individual changes rather than only team averages. Players should receive practical education on sleep, hydration, nutrition, rest and appropriate light recovery activity. During congested competition periods,

recovery information may be used alongside training-load and match-exposure information when considering training modification or rotation. Given the resource conditions reported in the study, low-cost recovery practices can provide a practical foundation while teams progressively develop access to sports-science support.

7. Limitations and Future Research

Several limitations should be considered. Firstly, only four teams were included, limiting generalisation beyond the participating regional teams. Second, recovery status was assessed subjectively with the Hooper Index rather than through direct physiological biomarkers. Third, the regression model included recovery status as a single predictor and therefore did not control simultaneously for other determinants of performance. Fourth, players were nested within four teams, so observations may not be fully independent. Fifth, the measurement point does not permit conclusions about changes in recovery across an entire competitive season.

Future research should use longitudinal or repeated-measures designs to examine changes in wellness across training microcycles and competitive periods. Multilevel or mixed-effects models could account explicitly for player clustering within teams. Future studies should also combine subjective wellness measures with objective indicators such as session-RPE, training duration, external-load measures where feasible, fitness testing and injury or availability records. Experimental or quasi-experimental studies could subsequently examine specific recovery interventions while controlling for training load and competition demands.

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Author Contributions

Claude Niba Ngwasiri: conceptualization, funding acquisition, methodology, project administration, software/statistical procedures, investigation, data collection, data curation, formal analysis, visualization, manuscript preparation. Ngalim Valentine: principal academic supervision, conceptual development and manuscript review. Apaak Daniel: co-supervision, conceptualization, validation, academic oversight and manuscript review. Nubonyin Hilda: conceptualization, methodology, manuscript review and supervisory guidance.

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Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable ethical and confidentiality requirements.

Conflicts of Interest

I declare no conflict of interest.

Abbreviations

DOMS, delayed-onset muscle soreness; NWRFL, Northwest Regional Football League; RPE, rating of perceived exertion; SD, standard deviation; SEE, standard error of estimate.

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