

Periodization of Training Load in Professional Footballers during the Competitive Cycle

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Abstract

The article examines the problem of training load periodization for professional football players under the conditions of an increasingly congested competition calendar and heightened injury risks. The relevance of the study is determined by the radical transformation of national and international tournament regulations, which shortens recovery windows and increases the economic cost of player absences, as well as by the necessity of rethinking traditional ideal microcycle models in favor of risk-oriented management. The study seeks toward developing a concept of periodization that prioritizes the sustained availability of key players for matches of the highest competitive value, rather than the mechanical accumulation of training volume. Proposed three-loop framework of load management provides the scientific novelty since it progresses from match value ranking to individualized load passports plus player vulnerabilities through systematic biological feedback. This approach reduces randomness when people decide plus incorporates training into a broader system that manages risk. The main findings indicate that, first, weekly monotony that it is excessive and strain do statistically associate with injury risk increasing and do therefore require systemic constraints; second, the U-shaped relationship by which exposure is at high-speed and injury risk underscores that work is in fact necessary regularly but it is dosed carefully at $\geq 95\%$ of individual maximal speed; third, an effective preventive axis must include that muscle groups that happen to be vulnerable train with eccentric strength, external loads individualize positionally, and stimuli of speed separate temporally from high volumes of accelerations and decelerations; fourth, operational monitoring should rely on a minimal package though consistent like jump tests, wellness questionnaires, orthostatic measures that unified reporting supports, which eases that organizational knowledge amasses. The article will be valuable to sports scientists, strength and conditioning coaches, and medical and analytical staff from professional football clubs. Furthermore, researchers both in sports medicine as well as load management will surely benefit from this article.

Keywords

Professional Football, Periodization, Training Load, Risk Management, Injuries, Monotony, Strain

1. Introduction

Within the research logic of modern competitive football, the objective function of in-season preparation is subordinated not to accumulating hypothetical kilometres nor to mechanically repeating standard weeks, but to ensuring the sustained availability of leading performers for matches of the greatest tournament value. In this framing, periodization manages risks as a system within which team efficiency is prioritized, where each player holds an individual overload risk budget, and each fixture is ranked by its relative importance. This change in coordinates stems from an objective transformation of the calendar: each club's competitive exposure increases as the Champions League transitions to a league phase (UEFA, 2025), involving thirty-six teams with eight games in the first stage. National leagues, meanwhile, have narrowed weekly recovery windows and increased the effective duration of play by introducing stricter accounting of added time and standardized time-loss allowances (Premier League, 2024). Relative to Tactical Periodization, the proposed three-loop framework acts as an overlay risk-governance layer: it complements TP by constraining weekly monotony/strain and sequencing speed and eccentric stimuli within any tactical model. When templates conflict with pre-set risk bounds, the risk bounds take precedence (Afonso et al., 2020).

The need that is for this goal setting is confirmed by one economic assessment of losses: the cost that is of wage losses due to injuries in the 2023/24 season reached approximately €732 million per that injury insurance index for those five strongest leagues. Injury frequency rose from the previous season, and the contribution of knee injuries and congested calendar segments is particularly prominent (Herman, 2024). The players' union monitors a further systemic argument and the 2023/24 report indicates that some professionals effectively receive less than one full day off in each week, and a substantial proportion of footballers play more than fifty-five matches during a season (Fifpro, 2024). These observations move the problem from the realm of methodology into that of managerial risk, where decisions on training stimuli and rotation constitute a unified task alongside logistics, sleep, and recovery.

2. Materials and Methodology

The study of training load periodization for professional footballers in the competitive cycle is based on a comprehensive analysis of academic sources, consensus documents, and applied reports focused on load management, injury risk, and calendar management in football. The theoretical foundation comprises works on

monitoring external and internal load (Clemente et al., 2019), systematizing tactical periodization (Afonso et al., 2020), and research on the relationship between high-speed exposure and the probability of muscle injuries (Buchheit et al., 2023; Green et al., 2020). The set of regulatory and organizational documents includes the International Olympic Committee's consensus materials upon permissible load volumes (Soligard et al., 2016), updated rules for calculating added time (Premier League, 2024), and the parameters of the Champions League format (UEFA, 2025) defining the objective boundaries of the competitive calendar. Additionally, data about the cost and structure of injuries (Herman, 2024) were used. Fifpro also used reports on the real recovery plan of players during season (Fifpro, 2024).

The work methodologically combines a total of three complementary approaches. Empirical data (Oliva-Lozano et al., 2021) on the weekly load structure with one and two matches was compared with ideal microcycle models as well as risk-oriented management practices in a comparative literature analysis. Next, researchers systematically reviewed effective preventive programs namely eccentric exercises for at-risk muscle groups (Dalen-Lorentsen et al., 2024) plus circadian fatigue protocols during travel (Janse van Rensburg et al., 2021). Third, content analysis of applied case studies and meta-analyses on fatigue monitoring were conducted, including jump tests and subjective wellness scales (Evans et al., 2021), which enabled the refinement of biological feedback tools.

3. Results and Discussion

Within the core, it is advisable to organize decision-making along three interrelated loops. The first loop concerns the value of the upcoming match: over the next few weeks, fixtures are ranked by tournament value and logistics complexity. For the weeks preceding a high-value game, upper bounds for monotony and weekly load strain are set in advance. The second loop addresses personal risk: for each player, a passport of external load and vulnerabilities is maintained, depending on on-field role, injury history, and current status; this passport dictates the form and magnitude of speed, strength, and tactical-technical stimuli. The third loop is biological feedback: brief readiness tests and subjective wellness scales are compared daily with external and internal load parameters, and discrepancies from the expected dynamics trigger adjustments. As shown in **Figure 1**, this order—from value to individual and then to means—reduces the share of ad-hoc decisions and renders the weekly configuration more robust to calendar perturbations.

Substantively, load is considered in two planes. External load is the structure of mechanical events (the share of high-speed segments, the number of accelerations and decelerations, angular turns, jumps, contact duels), detailed by days of the micro-mesocycle; the weekly profile in stable teams is characterized by a rise in volume and intensity in the middle days and a regular decline toward the day before the match. Internal load is the physiological and subjective response of the

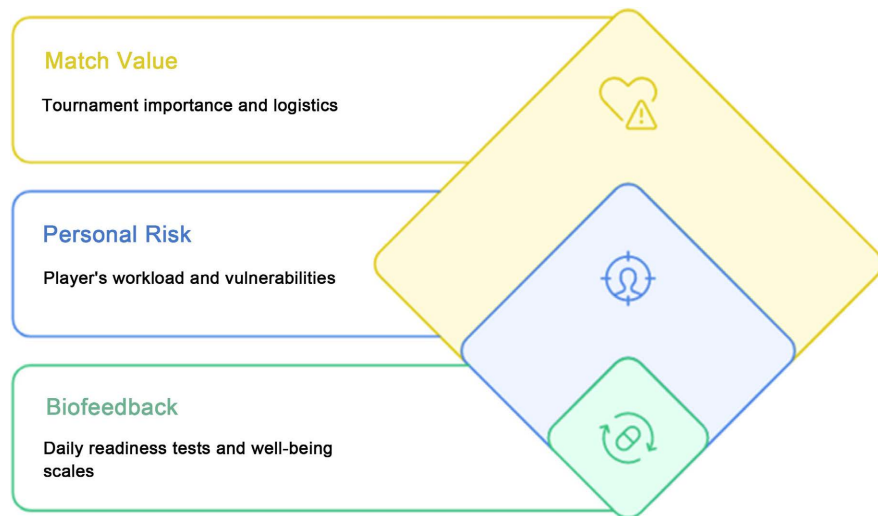


Figure 1. Decision-making framework.

body, which in practice is reduced to the integral assessment session rating of perceived exertion (session-RPE) multiplied by session duration, followed by the computation of weekly monotony (the ratio of the weekly mean to the standard deviation) and weekly strain (the product of total weekly load and monotony). The classical definitions used are as follows: training monotony = mean daily load across a week divided by its standard deviation; weekly strain = cumulative weekly load multiplied by training monotony, where weekly load is calculated as the product of session-RPE and session duration summed over the week. Increases in these indices have been associated with a higher incidence of adverse outcomes and are employed for operational risk management.

These constructs are demonstrably acceptable for operational management and are linked to risks of adverse outcomes under high monotony; see, for example, the review on the session-RPE method and the sources on the concepts of monotony and strain (Clemente et al., 2019).

Constructing weeks inside this frame depends on constraints and departs from the ideal microcycle dogma. For one match in a week a mid-week peak dynamic remains preferable. However, the main tactical amount must not soak up the sprinting increase by increasing the quantity of frequent speedings up and slowings down on nearby days. Otherwise, the meaning in speed exposure that is specific is then lost. By reason of a pair of matches, peak loads happen by definition on the games themselves, as well as training days mainly intended for recovery with activation; catching up upon volume for the starting group between fixtures is, on average, not quite so rational also carries an apparent increase within risk without any concrete gain concerning readiness, aligning to the temporal profile concerning post-match recovery with the critique relating to calendar congestion inside consensus documents (Oliva-Lozano et al., 2021).

Speed occupies a special place as a two-faced factor—a decisive predictor of competitive threat and a source of vulnerability for the muscle-tendon structures.

The scale of observations in team sports indicates that excessive and abrupt spikes in high-speed running increase the likelihood of posterior thigh injuries; conversely, a dosed exposure to speeds individually close to maximal during the week is associated with lower match risks, especially with careful temporal placement (e.g., exposures at >95% of individual maximal speed on the second day before a game) and with careful separation from days with high volumes of repeated accelerations and decelerations (Buchheit et al., 2023). An extensive multicentre analysis spanning 36 seasons (627 players, 96 match hamstring strain injuries [HSIs]) demonstrated that when MD-2 training exposure exceeded 95% of individual maximal sprinting speed (MSS) no match-day hamstring injuries were recorded; moreover, in approximately half of the analyzed match-turnarounds the occurrence of at least one exposure > 95% MSS was similarly associated with a zero incidence of such injuries, whereas in the absence of, or at lower, exposures injuries occurred at an incidence of approximately 2 - 5 cases per 1000 player-turnarounds. These findings support the inclusion of brief “near-MSS” stimuli on MD-2.

Accumulated data emphasize a U-shaped relationship between risk and high-speed work: both underexposure and abrupt overexposure are hazardous, whereas moderate but regular encounters with high speeds within a stable, chronic training load profile have a protective effect (Green et al., 2020). Practical implementation involves brief speed series performed in a fresh state with full recoveries and strict control of neighboring calendar clusters of accelerations and sharp decelerations. The main principles of external and internal load are shown in Figure 2.

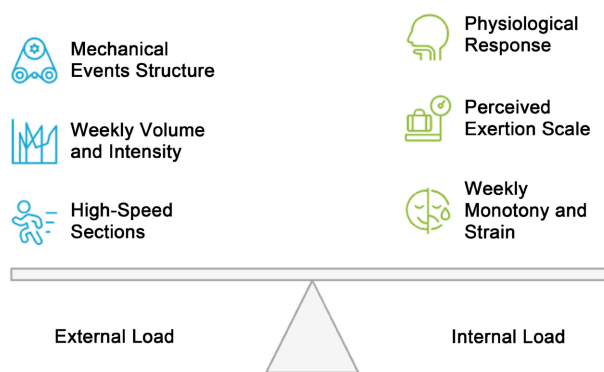


Figure 2. Balancing external and internal training loads.

The second supporting axis of prevention is systematic eccentric strength work for vulnerable muscle groups. A meta-analysis of the Nordic hamstring exercise reveals approximately a twofold reduction in the frequency of corresponding injuries. For the groin area, a preventive effect is demonstrated for programs emphasizing the adductors, including the Copenhagen variant (Dalen-Lorentsen et al., 2024). In a meta-analysis of 8459 athletes, inclusion of the Nordic Hamstring Exercise approximately halved the risk of hamstring tendon injuries: relative risk (RR) = 0.49 (-51%; 95% confidence interval [CI] 0.32 - 0.74) (van Dyk et al., 2019). For the groin, a cluster-randomized controlled trial in 652 footballers

demonstrated a 41% reduction in the mean-season prevalence of groin problems with an Adductor Strengthening Programme based on the Copenhagen exercise, with an odds ratio (OR) of 0.59 (95% CI 0.40 - 0.86) (Harøy et al., 2018).

In the weekly structure, this is implemented as one saturated strength pair in the middle day and a short maintenance block closer to the match; with two games, micro-dosing is applied while maintaining an eccentric emphasis and technique. An important detail is pre-sprint preparation (mobilization of the hip joint, thigh, and ankle, and correction of gross running-technique errors) to reduce peak mechanical stresses on soft tissues.

Positional individualization is not an aesthetic option but a necessary condition for rational dosing. Full-backs and wide attackers bear the largest share of high speeds and sprints and require regular yet economical speed exposures. A series of decelerations and duels more often overload centre-backs—their prevention shifts the emphasis to the adductors and hamstrings and requires careful dosing of turning episodes. Central midfielders operate within a density of moderate speeds; coordination, ankle stability, and the triceps surae complex are key priorities. For forwards, short accelerations with complete recovery and practicing finishing actions in a fatigue-neutral state are advisable. Goalkeepers combine low running volume with a high frequency of explosive movements, jumps, and horizontal decelerations; their intensive blocks are synchronized with the team's middle days while remaining mechanically specific (Hernández-Beltrán et al., 2024). Ignoring these differences is a direct path to inefficiently spending the week's risk budget. For example, accelerations/decelerations, elite match tracking reports on average $\sim 81 \pm 2$ accelerations and $\sim 84 \pm 3$ decelerations per match, with wide players performing the highest counts and central defenders the lowest; position-dependent differences are also confirmed in a cross-league analysis (EPL vs Ligue 1) (Vigh-Larsen et al., 2018; Morgans et al., 2025).

Operational monitoring tools should remain regular and straightforward. Brief jump tests (in particular, the countermovement jump) are sensitive to post-match fatigue in the 48 - 72-hour window. Meta-analyses and applied studies confirm acceptable reliability and sensitivity for both jump height and derived force and impulse parameters (Evans et al., 2021). In combination with wellness questionnaires (sleep, soreness, stress, mood) and orthostatic measurements, they form a minimal package for daily assessment and plan adjustment. Explicitly acknowledged psychological load as a distinct contributor to overall risk: meta-analyses show that stress-related variables are statistically associated with increased injury risk, reinforcing the value of routine psychometric screening alongside physiological metrics (Ivarsson et al., 2017).

A unified reporting form for the coaching staff is desirable, as it records the reasons behind each adjustment and compares them with the actual weekly outcome, thereby reducing the episodic nature of decisions and ensuring that organizational knowledge is accumulated. Practical implementation barriers are primarily organizational: securing coach buy-in against entrenched routines, nomi-

inating a single owner of the load dashboard, and managing data in resource-limited environments. In constrained settings, a minimal stack (session-RPE→weekly monotony/strain, CMJ, and one near-MSS exposure on MD-2) delivers most of the actionable signal when reporting is consistent.

A quite moderate approach is one suitable for the tactical structure of training. That approach is neither too aggressive nor too lenient. Systematic reviews reveal a deficit of direct empirical data despite common models, as well as they propose shifting the center of gravity from ideology to the measurable responses of the team and each player. A practical form is a load passport for typical game series: pitch size, player numbers, series and pause duration, rules and constraints, with a known physiological and mechanical cost of the exercise. This approach transforms constructing the day into an optimization problem rather than relying on guesswork (Afonso et al., 2020). Calendar principles remain primary: in weeks with two matches, development yields to expressing game principles through economical forms.

Return to play after injury fits into the overall managerial framework and is treated as a continuum of risk management. The decision is made collegially and is based on a set of domains: the strength and power of the target segment, the ability to accelerate and decelerate at previously characteristic levels, ranges of motion, the absence of pain, and player confidence. The unification of terminology for the groin region, as outlined in the Doha agreements, facilitates diagnosis and the comparability of programs. The decision logic itself is formalized through a stratified assessment of baseline risk, risk modifiers, and contextual tolerance for risk (Weir et al., 2015). Thus, clearance in a blank week and on the eve of a high-value game are essentially different decisions, which allows the integration of biomechanics, calendar, and tournament mathematics.

Travel and match start times complete the picture. Consensus materials about preventing fatigue from flights and circadian rhythm disruptions offer simple yet discipline-demanding measures such as managing light and darkness, using melatonin when necessary, protecting sleep, and shifting peak training stimuli to the days after travel. Evening kick-offs, as well as night flights, make this especially critical since physiological signals are distributed differently. The former ideal week then ceases to be optimal anymore (Janse van Rensburg et al., 2021). Those who train precisely and promptly tend to find success more often than those who train more frequently, as the outcome remains the same.

The management loop closes through a data language. Agreed definitions of injuries and illnesses, as well as standardized methods of accounting and reporting, daily summaries, and a unified traffic-light readiness system enable synchronized decisions on load adjustments for starters, reserves, and return-to-play athletes. Harmonization of epidemiological surveillance, supported by industry consensus, is not bureaucracy but a prerequisite for comparability and, therefore, quality management over a long season (Soligard et al., 2016). The main principles of training strategies are shown in **Figure 3**.

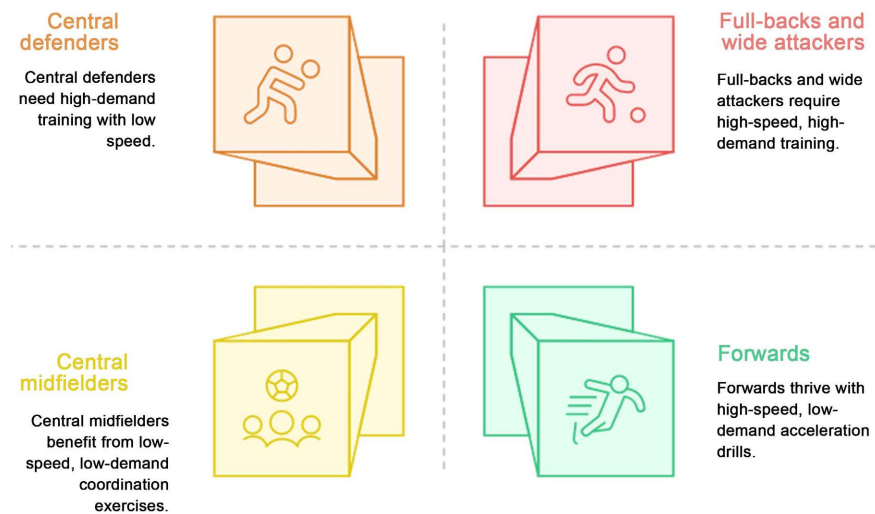


Figure 3. Prioritizing training strategies for football players.

In summary, a sequence distinct from traditional approaches can be formulated. First, a map of the value of upcoming matches and logistical constraints is drawn up, with upper bounds on weekly risk. Next, individual player profiles are overlaid, including positional vulnerabilities and specific goals (speed, eccentric strength, coordination, musculoskeletal stability), after which the week is constructed as a constrained optimization problem: economical speed exposures in fresh windows, a maintenance eccentric strength pair on the middle day, minimization of the noise of repeated accelerations and decelerations around speed series, and a rational share of game forms with a known physiological cost in advance. At each step, decisions are validated using brief readiness tests and integral indicators of internal load, and adjustments are recorded with stated causes and consequences. As a result, the stability of leading performers' availability becomes a manageable property, and the weekly dynamics of load become a means of risk control rather than an end in itself. This is the essence of the shift in the core content: from templated routines to risk-oriented management, from quantitative accumulation to value-based dosing, from dogma to verifiable and comparable decisions. Such a construction enables the maintenance of competitive efficiency without increasing injury rates under a congested calendar: limiting weekly monotony and strain, systematically supporting speed qualities and eccentric strength of vulnerable muscle groups, accounting for positional differences in external load profiles, and confirming the correctness of the course through regular biological feedback. When these elements are combined, the league table begins to reflect not only technical-tactical quality but also the quality of managing time, health, and the uncertainties of the season.

4. Conclusion

The proposed model of periodization redefines training practice in the coordinates of managed risk as well as tournament value, plus it shifts the emphasis from

volume accumulation for the purpose of maintaining the sustained availability of leading performers at the most important matches. The core of the solution involves three loops of the logic. The logic initially ranks future fixtures by value and logistical limitations then uses a passport of load and vulnerabilities that is personalized. Finally, the logic incorporates biological feedback for verifying the planned trajectory's correctness daily. Such cascading causality—value, individual risk, means—reduces calendar stochasticity, formalizes bounds for weekly monotony and strain, and translates weekly construction from dogmatic micro-modeling into a constrained optimization problem.

The substantive axis of the conclusion is dual. On the one hand, the external mechanics of load are structured by the days of the micro-mesocycle, with a predictable mid-week apex when there is one match, and with match exposure dominating when there are two. At the same time, training stimuli are deliberately separated in order that tactical volume will not compromise speed specificity. Internal load, on the other hand, is aggregated by way of session-RPE with derivative metrics that include weekly monotony and also strain. These metrics serve as operational predictors of adverse outcomes also anchors for adjustments. That key, fundamentally non-binary thesis is the U-shaped relationship of risk and high-speed work: deficit and abrupt surge are hazardous; encounters at speeds that are regular and dosed create a protective effect, exceeding ~95% of the individual maximum, when they are temporally separated from large volumes of repeated accelerations and decelerations. Concrete weekly constructs follow: brief speed series in fresh windows, minimization of noise around them, and a maintenance eccentric strength pair in the middle days as the second supporting preventive axis.

Individualization by playing role is not a stylistic device but a mechanism for economical expenditure of the risk budget: flanks—targeted yet economical speed exposures; center-backs—emphases on eccentric work for the hamstrings and adductors with control of turning episodes; central midfielders—coordination and stability of the ankle-triceps surae complex; forwards—short accelerations with complete recovery and fatigue-neutral practice of finishing actions; goalkeepers—specific explosive blocks synchronized with the team's middle days. Return to play after injury fits into the same risk-management continuum: what is cleared is not symptoms but integrated readiness across the domains of strength/power, acceleration/deceleration, ranges of motion, pain status, and confidence—with an explicit dependence of the decision on the week's tournament context. Operational monitoring is based on a minimal yet regular package (jump tests, wellness questionnaires, orthostatic measurements) and a unified reporting form that records the causes and consequences of adjustments. Travel and kick-off times can be addressed through circadian rhythm and through sleep hygiene protocols that can then prevent the breakdown of ideally symmetric microcycles under logistical influence.

In summary, harmonized terminology as well as a unified data language plus a

traffic-light system do form a management loop ensuring comparable decisions for starters, reserves, and rehabilitating players. We may infer: people who train specifically and promptly succeed, not merely people who train harder. Congested calendars achieve sustained competitive efficiency via limited weekly monotony and strain, systematic support of vulnerable groups' speed qualities and eccentric strength, position-specific external load dosing, and regular course validation through biological feedback. Weekly dynamics do cease to be as an end in themselves within such a system. They become a device to control seasonal unknowns instead. The chart mirrors the skill-related sort. It also reflects on the quality of decisions when time, health, and risk are regarded.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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