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# Training Load and Player Monitoring in High-Level Football: Current Practice and Perceptions

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Training load (TL) is monitored with the aim of making evidence-based decisions on appropriate loading schemes to reduce injuries and enhance team performance. However, little is known in detail about the variables of load and methods of analysis used in high-level football. Therefore, the aim of this study was to provide information on the practices and practitioners' perceptions of monitoring in professional clubs. Eighty-two high-level football clubs from Europe, the United States, and Australia were invited to answer questions relating to how TL is quantified, how players' responses are monitored, and their perceptions of the effectiveness of monitoring. Forty-one responses were received. All teams used GPS and heart-rate monitors during all training sessions, and 28 used rating of perceived exertion. The top-5-ranking TL variables were acceleration (various thresholds), total distance, distance covered above 5.5 m/s, estimated metabolic power, and heart-rate exertion. Players' responses to training are monitored using questionnaires (68% of clubs) and submaximal exercise protocols (41%). Differences in expected vs actual effectiveness of monitoring were 23% and 20% for injury prevention and performance enhancement, respectively ($P < .001$ $d = 1.0–1.4$). Of the perceived barriers to effectiveness, limited human resources scored highest, followed by coach buy-in. The discrepancy between expected and actual effectiveness appears to be due to suboptimal integration with coaches, insufficient human resources, and concerns over the reliability of assessment tools. Future approaches should critically evaluate the usefulness of current monitoring tools and explore methods of reducing the identified barriers to effectiveness.

***Keywords****:* injury, performance, team sports, workload

As part of efforts to minimize injury occurrence and increase performance, many high-level football teams employ fitness and sport-science personnel who engage in the monitoring of training load (TL) on a daily basis.[1] TL is typically represented as external and internal training load, defined respectively as the work done by the athlete (eg, distance ran, number of sprints) and the associated physiological response (eg, heart rate, perception of effort).[2] Evidence exists for a relationship between TL and performance and between TL and injury risk,[3,4] but little is known of how these methods are applied in football.

Developments in technology and analytical methods have led to new possibilities in the applied environment, and practitioners now have the ability to monitor TL using global positioning systems (GPS) and other microtechnology. This contemporary technology produces a plethora of variables enabling practitioners to quantify TL in greater detail than ever before. However, there is currently no consensus as to which variables are most useful or, indeed, how to analyze the longitudinal data of a diverse squad of players. In addition to the quantification of TL, practitioners may employ discrete physiological, physical, or psychological assessments to infer player responses to the training program. These assessments may include blood or saliva analysis, monitoring of autonomic nervous system function using heart-rate indices, various maximal and submaximal performance measures, and subjective athlete self-report measures. As with TL quantification, little is known of the current practices and associated challenges of applying these methods in professional football, as they are not sufficiently acknowledged in the published literature.

Elite and professional teams may previously have been reluctant to divulge their practices, but recent research has demonstrated their willingness to engage in and publish applied research.[5,6] Providing a snapshot of the current practices and perceptions of monitoring will serve to highlight the challenges faced by practitioners and stimulate further industry-relevant applied research. Therefore, the aim of the current study was to describe the monitoring puzzle from a top-down (why we measure TL) and bottom-up perspective (how and what is measured and analyzed) to provide an up-to-date account of current monitoring practices in high-level football.

## Methodology

### Subjects

Practitioners from 82 professional clubs from the United Kingdom (ie, English Premier League, English Championship, Scottish Premier League), United States (Major League Soccer), Spain (La Liga), France (Ligue Un), Italy (Serie A), the Netherlands (Dutch Eredivisie), Germany (Bundesliga 1), Switzerland (Super League), and Australia (A league) were identified from our professional network and invited to participate in this study. Institutional review board approval was granted before the commencement of this study in accordance with the Declaration of Helsinki.

### Methods

An invitation to participate was e-mailed to a member of the sports-medicine or sports-science department of each of the invited clubs.

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Eligibility criteria specified that the respondent should be the individual responsible for the monitoring process. If no response was received within 1 month of the initial invitation, a second e-mail was sent. A third e-mail was sent in the event of no response after 1 month of the second e-mail. If no response was received to the third e-mail, a classification of "no response" was assigned. Participants indicated their willingness to participate by ticking the "I agree to participate" box on the first page of the survey.

The survey (available as an attachment to the online PDF for this article) contained 15 questions (9 open and 6 closed) relating to the objectives and methods of monitoring, data analysis, and perceptions of effectiveness. Practitioners were asked about their perceptions of the effectiveness of monitoring and indicated their *expected* (based on theoretical scientific concepts) and perceived *actual* effectiveness (based on experience) of monitoring for reducing injury rates and improving performance in football. A method similar to that used by McCall et al[7] was used to assign scores to ranked responses. For instance, when respondents were asked to rank in order of importance the variables used to quantify TL, 10 points were awarded to the variable ranked in first place (the most important), 9 points for second place, and so on. In nonranking questions such as barriers to effectiveness, which used a 5-point scale, scoring corresponded to the number allocated on the scale.

A limitation of this study is that we used a convenience sample and did not approach all high-level football clubs. We also acknowledge that only clubs with an established sport-science department were invited to participate.

## Statistical Analysis

Data were examined for normal distribution using the D'Agostino-Pearson Omnibus normality test. Normality was satisfied ($P > .2$) and within-participant differences in paired data were tested using Student *t* test. For data over multiple subquestions, ANOVA for repeated measures with adjusted post hoc Tukey test was performed with significance accepted at $P < .05$. The standardized mean difference (effect size, *d*) was also calculated as previously described.[8] For the purposes of this analysis, an operationally relevant smallest worthwhile change (SWC) of 1 was used for data collected using Likert scales. Data are presented as mean ± SD (90% confidence intervals) unless otherwise stated.

# Results

In total, 48 surveys were returned (59% response rate), with 5 (6%) invitees declining to participate and 29 (35%) not replying to invitation e-mails. Seven responses were excluded from the final analysis due to incomplete answers that despite follow-up communications were unable to be reconciled. Subsequently, questionnaires from 41 teams (50%) were included in the final analysis: 16 English Premier League, 7 Major League Soccer, 7 English Championship, 4 Ligue Un, 2 teams from the Scottish Premier League, and 1 team from each of Serie A, La Liga, Dutch Eredivisie, Australian A League, and the Swiss Super League.

Respondents included 28 sport scientists (68%), 10 fitness coaches (24%), and 3 strength and conditioning coaches (7%). All clubs employed at least 1 fitness coach or sport scientist (range 1–4), and 17 employed a dedicated data analyst for the purposes of analyzing monitoring data. Respondents indicated that although personnel were given job titles such as sport scientist, fitness coach, or strength and conditioning coach, the duties fulfilled by these staff were varied and widely overlapping.

The objectives of monitoring were ranked in order of perceived importance, with a maximum possible score of 205 points (eg, 41 teams × 5 points for greatest importance). The objectives of "improve performance" and "management of TL distribution" jointly ranked first with 132 points. The objective of "injury prevention" was third with 117 points, and "coach feedback" was fourth with 66 points.

## Measuring Training Load

Of the 41 surveyed clubs, 40 collected heart-rate and GPS data from every player during every field-training session. The remaining club objectively quantified TL for every session but on a subgroup of the squad due to limited equipment (Figure 1).

A total of 56 different TL variables were identified (Figure 2), with teams recording 7 ± 2 (range 4–10) variables for training sessions and 3 ± 2 (range 0–7) variables for competitive matches. The majority of speed–time variables used were based on absolute thresholds or percentage of maximum speed (Figure 3), with 2 practitioners also using relative physiological thresholds (speed at lactate threshold [n = 1] and speed at maximal aerobic speed [n = 1]).

## Measuring the Response

Subjective athlete self-report measures such as questionnaires including Likert or visual analog scales were the most-often-used response measure (Table 1). Twenty-five teams (61%) indicated the use of nonexhaustive exercise protocols as a means of determining players' responses to training. Other forms of response monitoring including saliva analysis, blood analysis, heart-rate variability,

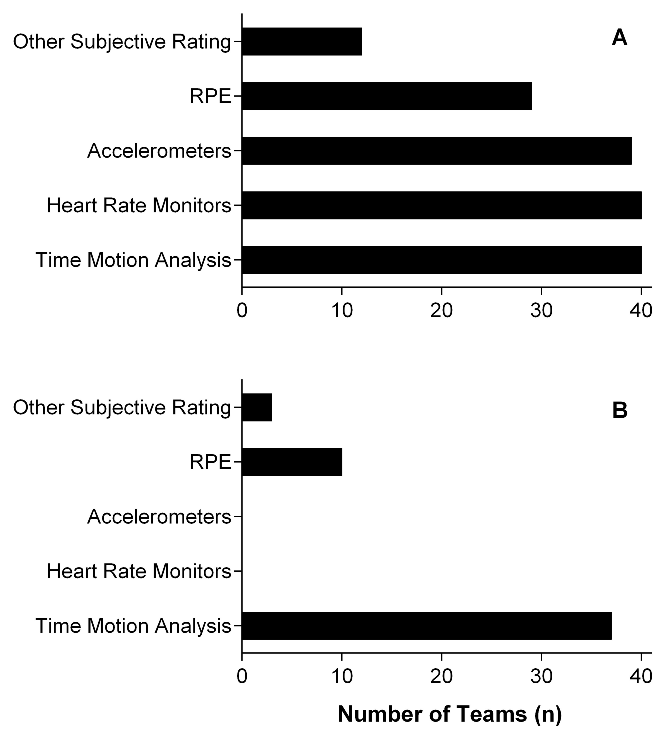


**Figure 1** — Tools used to quantify training load during (A) training practices and (B) competitive matches. Abbreviation: RPE, rating of perceived exertion.

**Acceleration**: Peak acceleration (m/s²), velocity change load[a] (AU), >1.0 m/s², >2.0 m/s², >2.5 m/s², >2.75 m/s², >3.0 m/s², >3.5 m/s², >4.0 m/s²

**Speed–time**: Average velocity, speed intensity, >4.0 m/s, >4.5 m/s, >4.7 m/s, >5.0 m/s, >5.5 m/s, >5.8 m/s, >6.0 m/s, >6.7 m/s, >7.0 m/s, >7.5 m/s

**Relative speed**: Greater than velocity at maximal aerobic speed, greater than velocity at lactate threshold, peak speed, >60%, >65%, >70%, >80%, >90% of maximal speed

**Heart rate (beats/min)**: average heart rate during the session; greater than heart rate corresponding to the lactate threshold, >70% of maximal, >80% of maximal, >80% of heart-rate reserve, >85% of maximal, >90% of maximal, heart-rate-exertion score

**Subjective**: rating of perceived exertion, cognitive load, coach observations

**Accelerometry**: Player load[b] (AU), Body load[c] (AU), Step balance[d], Dynamic stress load[d] (AU), Change of direction (n), IMA[e], Jumps[e] (n)

**Metabolic power**: Average metabolic power (W/kg), explosive distance, >20 W/kg, 20–35 W/kg, 35–55 W/kg, >55 W/kg

**Other**: Total distance covered (m), training duration (min)

**Figure 2** — Training-load parameters and time–motion thresholds identified from 41 survey responses. Abbreviations: AU, arbitrary units. Note: Cognitive load, assessed by questionnaire; velocity change load, sum of acceleration load, deceleration load, and agility load derived from the force of the action, the number of actions, and the body mass of the player; speed intensity, unknown; player load, body load; step balance, dynamic stress load, and IMA derived from accelerometer and calculated using manufacturer's unique algorithm. [a] Athletic Data Innovations, Sydney, Australia. [b] Catapult Innovations, Scoresby Australia. [c] SPI-Pro GPSports, Canberra, Australia. [d] STATSports UK, Co. Down, UK. [e] Time–motion variables recorded by teams included the number of discrete efforts and the total distances covered within the defined thresholds.

and physical match output (time–motion variables) were also used at varying frequencies (Table 1). Eight responders (20%) did not disclose any specific procedures or assessments used to measure players' responses, and 2 (5%) stated that they did not employ any procedures for this purpose.

## Analysis and Interpretation

Thirty-seven (90%) of the respondents used Microsoft Excel to construct bespoke systems to store, analyze, and report data, with 23 (56%) of those also using an additional software program. Respondents indicated that TL variables were used to construct normative ranges for specific within-season time periods (eg, macrocycles and mesocycles). Twenty-one (51%) practitioners indicated that TL data were used to compile individual profiles for each player using the "match day minus" format. In this format, each training session is categorized by its proximity to match day (eg, 1 d before the match). Using historical data, a player's individual normative range for a given day can be established. Participants in the current study used mean ± SD, mean ± 0.5 CV, and mean ± SWC to identify when players might be outside of their normal range on any given day.

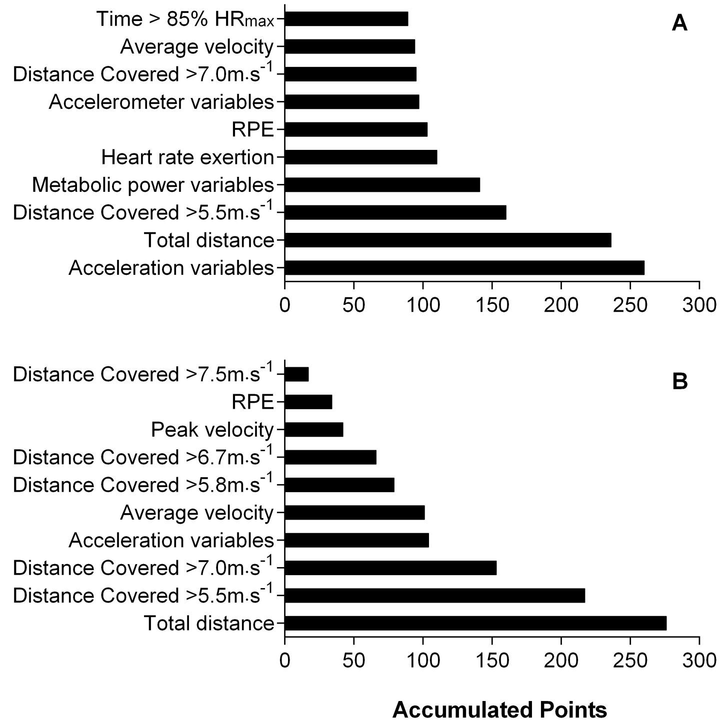


**Figure 3** — The top-10-ranked variables used to quantify training load during (A) training practices and (B) competitive matches. Abbreviations: $HR_{max}$, maximal heart rate; RPE, rating of perceived exertion.

Rolling averages are used for periods ranging from 3 days to 6 weeks to provide information on acute and chronic TL accumulation. Some practitioners expressed accumulated TL variables (rolling average) relative to the players' maximum or planned accumulation of that variable over the same time period. Several practitioners indicated that they also expressed TL relative to a player's mean or maximum match load as a measure of training status. The primary- and secondary-ranked factors used to inform prescription and adjustment of in-season training load were recent match minutes played (115 points) and upcoming fixtures (102 points). Accumulated TL (84 points) and the subjective feedback received from players (57 points) were ranked third and fourth, respectively (maximum score of 205 points). Session feedback and information on individual players' loads and status are typically communicated daily to the coaching staff.

## Perceived Effectiveness

Actual effectiveness of TL monitoring was rated as being lower than the expected effectiveness for injury prevention (–1.7 points; 90% CI –1.4, –2.0), individual player performance enhancement (–2.0 points; 90% CI –1.5, –2.4), and team performance enhancement (–1.6 points; 90% CI –1.3, –2.0), Figure 4) by magnitudes exceeding the SWC.

Practitioners scored limited human resources as the greatest barrier to effectiveness (118 points; Figure 5), followed by coach buy-in (114 points) and poor validity and reliability of assessments (105 points). When split into low (1–2 points) and high (4–5 points) scores, coach buy-in received the greatest number of high rankings.

**Table 1 Frequency and Type of Assessment Used to Determine Player Response to Training**

| Frequency | Maximal performance test | Submaximal, nonexhaustive performance test[a] | ASRM | Blood markers | Saliva analysis | Heart-rate variability | Standardized training drill | Match performance |
|---|---|---|---|---|---|---|---|---|
| Daily to weekly | 0 | 1 | 28 | 2 | 2 | 7 | 3 | 0 |
| Weekly to monthly | 0 | 16 | 2 | 4 | 2 | 3 | 12 | 36 |
| Monthly to quarterly | 13 | 8 | 2 | 0 | 5 | 2 | 0 | 2 |
| Biannually to annually | 13 | 0 | 0 | 4 | 1 | 0 | 0 | 0 |
| Never | 15 | 16 | 9 | 31 | 31 | 29 | 26 | 3 |

Abbreviation: ASRM, athlete self-report measures, eg, questionnaires, Likert scales, visual analogue scales.

[a] Jump tests are classified as nonexhaustive performance tests.

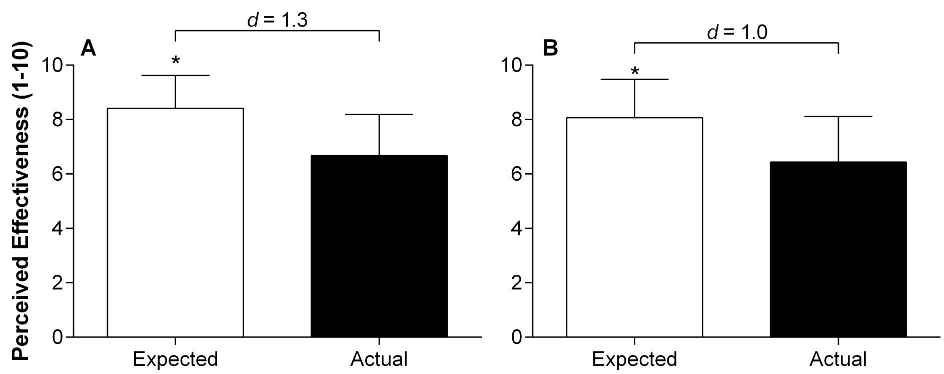


**Figure 4** — Perceived expected versus actual effectiveness of training-load-monitoring practices for (A) reducing injury rates and (B) improving team performance. Perceived effectiveness was scored on a scale from 0 to 10. *Greater than actual, $P < .001$, $d$ = effect size.



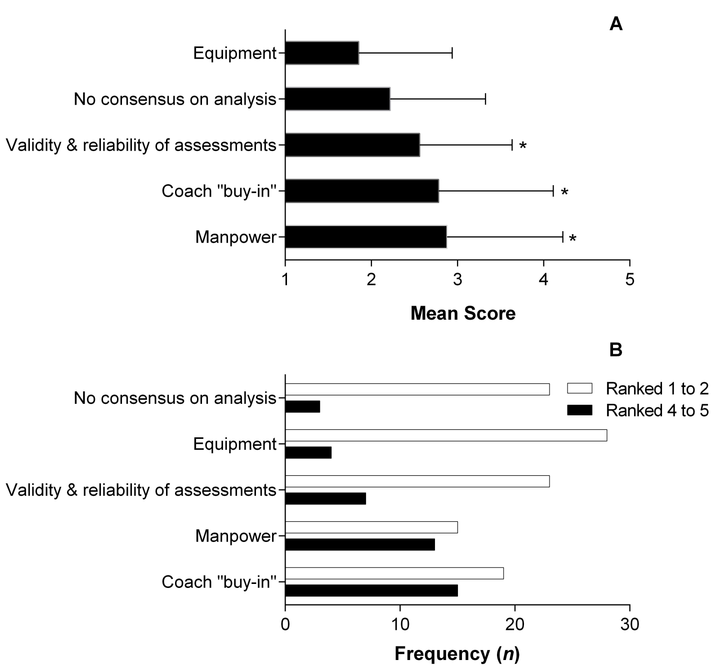


**Figure 5** — (A) Mean ± SD perceived barriers to the effectiveness of training-load-monitoring practices and (B) the frequency of low (ranked 1–2) and high scores (ranked 4–5) assigned to each barrier. *Greater than equipment, $P < .001$.

# Discussion

The main findings of this study are that there is no universally adopted monitoring approach in high-level football and perceived impact of monitoring on injury prevention and performance enhancement is lower than expected. This seems to be due to insufficient human resources, low coach buy-in, and poor sensitivity of field measures.

## TL Variables

Over 50 variables were listed as being used to quantify TL, with practitioners recording 7 ± 2 variables when monitoring training (excluding training duration). The plethora of identified variables may be reflective of the recent emergence of many, and a lack of empirical support for their validity, reliability, and usefulness. When considering that each variable can be expressed in absolute or relative terms with respect to time or total distance covered, among others, the potential number of available variables, and thus complexity, increases dramatically.

Time–motion external-TL variables relating to acceleration activity and distance covered above absolute speed thresholds used to demarcate high-speed or sprint running were the most commonly used. As injury prevention is an established objective of the monitoring process, and injury-mechanism studies have highlighted the role of intense activities in the contribution to injury, it seems logical that these variables are of interest to practitioners. However it is also the case that the validity and reliability of contemporary GPS technology to measure the most intense of these activities may be limited.[9,10]

Gross TL is the product of training frequency, volume, and intensity.[11] Current evidence suggests that sudden increases in training volume, intensity, and the product of volume and intensity are associated with increased risk of injury.[12–14] However, there is no consensus on which variables are appropriate as markers of football training volume or intensity. For instance, total distance or training time has been used as a marker of volume, and average speed (total distance/training time) has been used as a marker of intensity.[14] Overlooking the fact that an external-TL variable cannot truly be considered a marker of intensity but is instead density, the suitability of average speed may be questioned on other fronts. For instance, football is characterized by frequent brief intense actions including accelerations and decelerations, the magnitude, frequency, and physiological consequences of which are overlooked when considering only average speed.

The application of absolute versus individualized thresholds has been discussed in the literature.[15] Despite the compelling physiological rationale for the use of individualized thresholds, they appear not to be widely adopted in high-level football. This may be due to the current inability to extract individualized data from competitive-match time–motion analysis (eg, ProZone, Amisco), meaning that the cost:benefit ratio of implementing individualized thresholds during training alone may not be justifiable. However, this situation may soon change due to the amendment by FIFA permitting the use of microtechnology during competition.

Nevertheless, the current situation is that 4 of the top-10 variables used to quantify load during training cannot currently be measured during competitive senior matches due to restrictions on wearable microtechnology (heart-rate indices, accelerometer loads, metabolic power variables, many acceleration variables). The lack of alignment between training and match data may obstruct a comprehensive understanding of the accumulated TL of players across the season, so it is surprising that only 4 teams indicated the use of rating of perceived exertion (RPE) after matches. Conversely, RPE is a popular tool in applied research and is widely advocated as a suitable tool to monitor TL. The low use of RPE after competition may be a consequence of the sensitivity of the postmatch environment and the psychological states of players and coaches. The impact of competition, perceived performance, and match result, along with other contextual variables, appears to affect the validity and reliability of RPE after competition but requires further study.[16]

## Response Measures

Practitioners seek regular data to inform on the response of players to TL and examine the load-adaptation relationship. Submaximal shuttle runs appear to be especially popular, due in part to their ease of administration, ability to simultaneously profile multiple players, and minimal encroachment on planned training activity.

Those using submaximal running protocols analyzed exercise heart rate, heart-rate recovery, and/or accelerometer-derived measures as dependent variables. The interpretation of heart-rate indices is not based on any established criteria, and many teams implement criteria developed in-house (personal communication). Although practically attractive, the interpretation of exercise heart rate and heart-rate recovery during submaximal running protocols certainly presents a challenge in the applied setting. Ambient conditions, running surface, wind resistance, and hydration status, among other factors, can compromise the reliability of the test. In addition, a given change (eg, reduced submaximal exercise heart rate) can be caused by either increased fatigue or increased fitness, which makes interpretation less straightforward.[17,18]

Over half of the surveyed practitioners indicated the daily use of athlete self-report measures to monitor the psychobiological state and well-being of athletes, often in combination with objective data from submaximal protocols. In many instances questionnaires are completed on players' smartphones or tablets, which is in general agreement with the findings presented by Taylor et al[19] from a selection of high-performance sports. Subjective measures have been shown to be perturbed before decrements in performance can be observed and are therefore capable of early detection of functional and nonfunctional overreaching in athletes.[11] Data generated from athlete self-report measures can be available to club staff before training, allowing for analysis and discussions with coaching staff before finalizing training plans. However, player education must be provided, and the risk of noncompliance or players manipulating responses to their advantage must also be considered.[20] Nevertheless, athlete self-report measures may be a useful diagnostic tool to assist in the assessment of player training status, although more data on the reliability, sensitivity, and usefulness of these procedures are required.

The aim of collecting TL and response data is to facilitate evidence-based decision making on TL prescription. Data from this study suggest that previous and upcoming games appear to be the factors considered most when recommending or implementing adjustments to TL, which is in agreement with data from elite national teams.[1] This may be due to the importance placed on winning, the greater intensity of games versus training sessions, the established negative performance and increased injury risk of congested fixture periods,[21] and the ~5-fold greater injury incidence in matches than during training (27.5 ± 10.8/1000 h vs 4.1 vs 2.0/1,000 h, $P < .001$, $d = 3.0$).[22] These data may further underline the current lack of confidence in currently employed response measures and a primary reliance on the frequency of competition to inform periodization.

## Data Analysis and Interpretation

Ultimately, the effectiveness of monitoring is determined by the quality of decisions that arise from it and their impact, highlighting the importance of the analysis and interpretation. Two (5%) surveyed practitioners rated the lack of consensus on data-analysis techniques as greater than 4 out of 5 (Figure 5[B]), suggesting that this is not widely perceived as a significant barrier to effectiveness compared with other issues. Given our discussion regarding the recent increase in the number of available variables and the poor sensitivity of some response measures, this finding may appear surprising.

Many practitioners indicated the construction of individualized or specific normative ranges for each relative day of the microcycle, such as presented by Malone et al,[6] as well as normative ranges for a variety of other periods (ranging from 3 d to 6 wk). Deviations from the normal range are then identified by a departure from the player's mean value in excess of a predefined magnitude (typically 1 × SD or 0.5 × intraplayer CV% in the current sample). The most appropriate durations over which to consider TL accumulation are yet to be identified, although the increased rate of injury associated with congested fixture periods suggests that acute periods (≤7 d) should be included.[21,23]

Given the potential diversity of a football squad (eg, variation in nonmodifiable risk factors such as age, training history, injury history, etc) and the many degrees of freedom associated with resultant training and competition load (eg, playing time, positional role, opposition), TL and individual responses can vary markedly between players. Practitioners are therefore interested in detecting change within individual players. The magnitude of change of any variable must be considered in relation its intraplayer reliability.[8,24] A method advocated by Hopkins et al[8] expresses change relative to intraplayer reliability (CV%) using factors of 0.3, 0.9, and 1.6 for determining small, moderate, and large changes, respectively. However, from examination of the current data and published literature, this method does not seem to be universally adopted in high-level football or applied football research. The seemingly low use of such analyses in the club setting may be related to a lack of awareness of the statistical methods, insufficient experience in implementing the method with a large volume of data, or perhaps a lack of time as a result of insufficient human resources. Clubs and practitioners seeking to enhance the meaning and usefulness of their data may wish to familiarize themselves with these methods or seek outside expertise to assist with this process.

Discrete physiological or performance assessments may be of little use when considered in isolation. Practitioners may wish to use multiple assessments (eg, submaximal run, jumps, and subjective measures) to provide a more comprehensive picture of their athletes' status. Indeed, the current data support this approach as many practitioners indicated the use of multiple assessments. However, as human resources is a limiting factor, this approach may not be feasible for all clubs and may in fact lend itself more to confusion than to clarity. As eloquently discussed by Coutts,[25] simplicity may be the key to effectiveness, identifying the population-specific reliability of variables and tests in conjunction with the adoption of the concept used by Plews et al.[26] This concept uses statistical analysis to establish the minimum measurement resolution needed to gain useful information and may benefit practitioners by maximizing time efficiency without compromising the usefulness of the data collected.

## Perceptions of Effectiveness

Practitioners highlighted that poor validity and reliability of assessments represented a barrier to effective practice. As there is no gold-standard measure of football performance, practitioners turn to surrogate measures to gain understanding of players' physiological states or responses to training. Theoretically, this measure can then be used as the response measure in load-response modeling to establish the athletes' response to TL.[27] However, the diagnostic ability of discrete tests in isolation is limited, and realistically the practitioner must integrate several sources of data to facilitate decision making, which may not be feasible or desirable. In addition, the load-response and load-injury relationship is complex, and modeling of these data for the prediction of injury and performance may require advanced statistical methods and collaboration with experts.

Injury prevention and performance enhancement are the dominant objectives of the monitoring process. Focus on injury prevention is justified given the associated financial loss and negative impact on team success.[3] However, the current study indicates a clear gap between expected and perceived actual effectiveness at preventing injuries and improving performance. This finding may be partially supported by unchanging injury rates in professional football despite an increase in monitoring practices,[28] although there are obvious confounding factors to consider.[29] Alongside limited human resources (which may be viewed as less modifiable by the practitioners themselves), responders highlighted that coach buy-in was a substantial barrier to effectiveness, with 15 (37%) practitioners rating this as ≥4 on a scale of 1 to 5.

In many cases it is the coach who dictates the training program and therefore determines a large part of the TL. In order for the practitioner to influence change in a potentially inappropriate loading scheme, coach buy-in and effective communication are essential. Practitioners must have an understanding of the coaches' view of sport-science practices and its place in the overall process and to be cognizant of their primary role of supporting the coach. Strategies to improve coach buy-in lie in clarifying the role of the sport scientist and aligning practices to support the direction of the coach where ethically possible. For instance, through understanding how the coach may want individual players to perform, information on appropriate training programs to facilitate this can be provided. The common theme is one of effective communication, and a simple but effective strategy that practitioners may use to facilitate enhanced communication between the sport-science and coaching departments is to have the practitioner share an office with the coaches. This increases the opportunity for informal communication and thus increases the practitioner's understanding of the coach's view.

## Practical Applications

- Assessments used to monitor players' responses to training should be subjected to critical evaluation based on their reliability, usefulness, and feasibility.
- Clubs should use their under-21 squads for applied research due to the higher consistency of TL and monitoring data than with senior teams.
- Simplifying existing monitoring processes may partially alleviate the limitations imposed by limited human resources. In addition, forming partnerships with universities and the diligent employment of interns may be beneficial.
- Exploring communication strategies to enhance integration with coaches may increase buy-in and understanding of the support provided.

# Conclusion

The main findings of this study are that there appears to be no universally adopted approach for TL assessment in high-level football, perceived impact of monitoring on injury prevention and performance enhancement is lower than expected, and practitioners highlight insufficient human resources, low coach buy-in, and poor sensitivity of field measures as factors limiting the effect of monitoring on injury and performance. When interpreting these findings, the possibility of responder bias should be considered. For instance, participants of the opinion that monitoring is important may have been more motivated to respond to the survey than those who are not.

Future strategies should focus on establishing the validity, reliability, and usefulness of monitoring tools and variables and examining ways to enhance coach buy-in and the effective integration of sport-science support. Practitioners should be encouraged to conduct and publish in-house research where possible to aid in the objectives of identifying the usefulness of assessments and load variables.

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