



## Workload management strategies in football: A global survey project

### Gestion de la charge en football: Projet d'une enquête mondiale

Mohamed Saifedine Fessi<sup>1</sup>, Helmi Ben Saad<sup>2</sup>, Rafael Franco Soares Oliveira<sup>3,4,5</sup>, Jad Adrian Washif<sup>6</sup>, Karim Chamari<sup>7,\*</sup>, Wassim Moalla<sup>1\*</sup>

1. Research Laboratory: Education, Motricity, Sport and Health, R19JS01, University of Sfax, Sfax, Tunisia.
  2. Laboratoire de Recherche «Insuffisance Cardiaque», LR12SP09, Farhat Hached Hospital, University of Sousse, Sousse, Tunisia.
  3. Sports Science School of Rio Maior – Polytechnic Institute of Santarem, 2040–413 Rio Maior, Santarém, Portugal.
  4. Research Centre in Sports Sciences, Health and Human Development, 5001–801 Vila Real, Portugal
  5. Life Quality Research Centre, 2040–413 Rio Maior, Portugal
  6. Sports Performance Division, Institut Sukan Negara Malaysia (National Sports Institute of Malaysia), Kuala Lumpur, Malaysia.
  7. Aspetar, Orthopaedic and Sports Medicine Hospital, FIFA Medical Centre of Excellence, Doha, Qatar.
- \*. These two authors contributed equally to this study as senior authors

#### ABSTRACT

**Aim:** This research design protocol outlines the methodology for a thorough evaluation of workload monitoring and management strategies in football.

**Methods:** The study involves conducting a global survey to fitness coaches, sports scientists, analysts, and physicians with experience in load monitoring within football. The research adheres to the principles of the Helsinki Declaration and complies with General Data Protection Regulation standards, with ethical approvals obtained from multiple Ethics Committees across various countries, including Tunisia. A consortium of professionals collaboratively crafted the survey instrument, dividing it into seven sections, each addressing specific aspects of workload monitoring in football. Survey reliability will undergo evaluation in a pilot study utilizing Cronbach's alpha and intraclass correlation coefficient. To ensure inclusivity, the survey will be translated into multiple languages, facilitating participation from diverse regions. As such, survey distribution will consider online platforms (such as social media) and email invitations, with a specific focus on engaging football clubs, federations, and professional networks. The targeted sample size will remain at 385 participants. Statistical analysis planning encompasses descriptive examination, exploration of variable relationships, hypothesis testing, and qualitative analyses of participant feedback and recommendations regarding load monitoring practices.

**Expected results:** Expected outcomes include i) A comprehensive global overview of training and match load monitoring practices in football, ii) The identification of emerging trends, an improved understanding of training optimization processes, and iii) The development of practical recommendations to enhance player well-being and performance.

**Conclusion:** This study will contribute to the ongoing development of knowledge in the field of football workload monitoring.

**Key words:** Exercise Physiology, Monitoring, Player performance, Sport science, Training load

#### RÉSUMÉ

**Objectif:** Ce protocole de recherche décrit la méthodologie pour une évaluation approfondie des stratégies de surveillance et de gestion de la charge de travail en football.

**Méthodes:** L'étude implique la réalisation d'une enquête mondiale auprès des préparateurs physiques, des scientifiques du sport, des analystes et des médecins ayant de l'expérience dans la surveillance de la charge de travail en football. La recherche respecte les principes de la Déclaration d'Helsinki et elle est conforme aux normes du règlement général sur la protection des données, avec l'obtention d'approbations éthiques de plusieurs comités d'éthique dans différents pays, y compris la Tunisie. Un consortium de professionnels a élaboré collaborativement l'instrument de l'enquête, le divisant en sept sections, chacune abordant des aspects spécifiques de la surveillance de la charge de travail en football. La fiabilité de l'enquête sera évaluée lors d'une étude pilote utilisant l'alpha de Cronbach et le coefficient de corrélation intraclass. Pour garantir l'inclusivité, l'enquête sera traduite dans plusieurs langues, facilitant la participation de diverses régions. Ainsi, la distribution de l'enquête prendra en compte les plates-formes en ligne (comme les médias sociaux) et les invitations par e-mail, en mettant l'accent sur l'implication des clubs de football, des fédérations et des réseaux professionnels. La taille de l'échantillon ciblé est de 385 participants. La planification de l'analyse statistique englobe l'examen descriptif, l'exploration des relations entre les variables, les tests d'hypothèses et les analyses qualitatives des commentaires des participants et des recommandations concernant les pratiques de surveillance de la charge de travail.

**Résultats attendus:** Les résultats escomptés comprennent i) Une vue d'ensemble de la surveillance de la charge d'entraînement et de match en football, ii) L'identification de tendances émergentes, une meilleure compréhension des processus d'optimisation de l'entraînement, et iii) L'élaboration de recommandations pratiques pour améliorer le bien-être et la performance des joueurs.

**Conclusion:** Cette étude contribuera au développement continu des connaissances dans le domaine de la surveillance de la charge de travail en football.

**Mots clés:** Charge d'entraînement, Performance des joueurs, Physiologie de l'exercice, Sciences du sport, Surveillance

#### Correspondance

Mohamed Saifedine Fessi

Research Laboratory: Education, Motricity, Sport and Health, R19JS01, University of Sfax, Sfax, Tunisia.

Email: saifefessi@gmail.com

## INTRODUCTION

In football (soccer), the systematic monitoring of training and match loads has become a critical endeavour aimed at optimizing player performance, mitigating injury risks, and enhancing the efficacy of training regimens (1-3). The collaborative efforts of fitness experts, sports science professionals, and medical practitioners are pivotal in this multifaceted process (1-3). Their combined knowledge equips them to adeptly amass, scrutinize, and make informed decisions pertaining to training adjustments. A diverse collection of methodologies is employed by fitness experts, analysts, and scientists to comprehensively monitor players' workload, physical condition, and overall well-being (4). These methodologies can offer multifaceted assessments of injury risks, musculoskeletal health, and fitness levels (5); non-invasive assessments involving biological markers (6), such as heart rate monitoring and salivary sampling; as well as subjective evaluations, such as the rating of perceived exertion and well-being surveys (1,7). Furthermore, the advent of wearable technologies, sensors, and intelligent sportswear continuously provides invaluable data streams (8). Real-time information procured from global positioning system (GPS) devices, ultra-wideband trackers, and automated video analysis serves as an indispensable facet for monitoring on-field movements and supplying essential performance metrics encompassing parameters like distance covered, speed, and accelerations (9). These technological tools play a pivotal role in the comprehensive evaluation of player workload (1,8,9). Nevertheless, the substantial volume of data generated by this diverse array of methods poses notable challenges.

Despite extensive research confirming the accuracy and reliability of workload, well-being, and freshness measurements, there exists a conspicuous dearth of information pertaining to the specific methodologies and preferences adopted by analysts, scientists, and experts in the domains of load monitoring and injury risk management (1,4,6). These professionals grapple with the formidable task of distilling pertinent indicators from the flood of data, a process inherently influenced by their backgrounds and perspectives (1,2,5). Furthermore, the selection of methods and parameters is contingent on a countless of factors, including equipment availability, financial considerations, club regulations, and team dynamics (1,2). Gaining insights into how analysts, scientists, and experts gather and interpret data, alongside their viewpoints on workload management, is a crucial step toward the advancement of load monitoring. In addition, the knowledge, documentation, and endeavours to standardize these practices present a huge challenge for researchers in sports science (1,5). Contemporary surveying tools and techniques have substantially expedited the generation of survey data, enabling the collection of essential insights at scale through automated survey software deployed on online platforms, email, and social media (10,11). These tools, characterized by their extensive utilization, provide a potent instrument for gathering requisite information, facilitating the understanding and documentation of strategies for monitoring workload, and the potential standardization of preventive measures and management practices in football (1,2,5).

The primary objective of this protocol is to elucidate the methodological underpinnings of a comprehensive inquiry of workload monitoring and management practices in football. Central to this research endeavour is the administration of a global survey targeting individuals

who involves in football load monitoring, including fitness coaches, sports scientists, analysts, and physicians.

## METHODS

### Participants

The survey's target audience will comprise individuals aged 18 and older who serve in various capacities within football, including fitness coaches, sports scientists, analysts, or physicians, with experience in monitoring of training and match loads.

### Ethical considerations

Ethical principles, as outlined in the Declaration of Helsinki and compliance with the general data protection regulation for anonymous data processing are paramount in this study. Ethical approval has been obtained from the Ethics Committees of the Faculty of Medicine of Sousse, Tunisia, (Approval number CEFMS 199/2023) and the Polytechnic Institute of Santarem, Portugal (Approval number 23-2023ESDRM). As of mid-November 2023, additional applications for ethical approvals were under review by Ethics Committees in countries where data collection is planned. The research team remains committed to upholding the highest ethical standards and will promptly address any additional requirements or modifications requested by Ethics Committees in other regions.

A multi-language informed consent and information form for participants will accompany the survey in multiple languages. This document will provide participants with comprehensive information about the study and will seek their informed consent to participate. The multi-language informed consent and information form will cover the following four aspects: i) Informed consent: All participants in our survey will be required to provide informed consent to participate; ii) Ethical oversight: Rigorous ethical oversight has been established to ensure that all stages of our research adhere to the highest ethical standards. Our team is readily available to address any ethical concerns or questions that may arise during the study; iii) Linguistic diversity: To encourage participation from the targeted individuals around the world, we will translate our survey into multiple languages; and iv) Transparency: Upon completion of the study, we will provide comprehensive information about our research methodology, objectives, and findings, upholding transparency in our reporting.

### Sample size calculation

The sample size calculation was based on the following predictive equation (12):  $N = Z_{\alpha/2}^2 p (1-p)/i^2$ ; where "N" is the required number of participants; " $Z_{\alpha/2}$ " is the two-tailed normal deviate for type 1 error ( $Z_{\alpha/2} = 3.29$  for a significance level of 99.9%); "i" is the accuracy (=7.5%); and "p" is the estimated proportion of fitness and sports science professionals within a cohort who reported using monitoring training load for performance enhancement. Given the novel nature of our study, the proportion "p" was derived from a previous study involving 82 fitness and sports science professionals, where 20% reported using monitoring training load for performance enhancement (1). Based on this "p" ( $p = 0.20$ ), the estimated sample size was approximately 308 participants. To account for potential factors such as duplicate participants, data entry errors, and eligibility criteria, a cautious adjustment of 20% was applied, resulting in a sample size of 385 participants ( $385 = 308 / (1.0 - 0.20)$ ).

### Survey design considerations

The survey instrument, initially developed in English, was

collaboratively designed by a consortium of eight multidisciplinary experts in sports science and academia, as well as experts in load monitoring, encompassing both research and practice in football, from seven research institutions across five different countries. The principal investigator (FMS in the authors' list) is based in Tunisia. Following recommendations from the literature on survey-based research (10,11), the survey questions were developed, incorporating themes identified in previous research on training and match load monitoring in football. Consultations with industry practitioners and researchers further contributed to the refinement of these survey questions. The survey then underwent a comprehensive revision process to ensure completeness, accuracy, and clarity. Cognitive interviews were conducted initially to identify and rectify potential misinterpretations. The revised

survey underwent a second round of revision to verify the inclusion of both positively and negatively worded items and to apply a response scale, primarily utilizing single-choice and Likert-scale questions (13). The survey is approved by the research team leads, and has received unanimous approval from other members of the research team (Appendix available via this URL: <https://zenodo.org/records/1002801>; Last visit: October 20, 2023).

### Survey structure

The survey is structured into seven distinct sections, each meticulously addressing specific facets of workload monitoring in football. Table 1 provides detailed information about each section, including the number and types of questions.

**Table 1.** Sections and characteristics of the survey.

Section	Number of questions	Types of questions	Description
Preamble	-	Introduction and ethical considerations	An introduction to the survey and ethical guidelines for participation.
Section 1. Personal Information	16	Predominantly single-choice questions	Collects personal information about the participants, such as age, gender, education, and professional background.
Section 2. Training and Match Workload	8	Predominantly multiple-choice and Likert-scale questions	Focuses on monitoring training and match loads, including tools, experiences, and difficulties encountered.
Section 3. External Workload Monitoring	9	Predominantly multiple-choice questions	Explores the use of GPS, video analysis, and other tools for monitoring external workload in football.
Section 4. Internal Workload Monitoring	17	Predominantly multiple-choice and Likert-scale questions	Investigates the use of biological markers, heart rate monitoring, and subjective assessments for internal load.
Section 5. Well-being and Player Status	6	Predominantly multiple-choice and Likert-scale questions	Focuses on well-being questionnaires and their use in assessing player status and feelings.
Section 6. Fitness and Freshness	4	Predominantly multiple-choice and Likert-scale questions	Examines the use of fitness assessments to determine training effectiveness and player freshness.
Section 7. Custom Workload Monitoring	14	Predominantly multiple-choice questions and open-ended	Discusses customized tools, objectives, challenges, and strategies related to workload monitoring in football.
Ended	-		Thanks for participant
Contact Information	1	Single-choice (optional email address)	Requests optional contact information for sharing survey results and further discussions.

### Reliability of the survey

The survey's reliability, which pertains to whether the questions yield consistent information from respondents, will be assessed through a pilot study with a specific focus on evaluating the internal consistency of responses. Approximately 30 participants will be involved in this pilot study, which is considered adequate for its nature (14). Participants will be asked to complete the survey twice, and the agreement between the two will be determined by the intraclass correlation coefficient (ICC). To assess internal consistency, Cronbach's alpha will be employed, and a value above 0.7 in each survey section will be considered acceptable (15). If Cronbach's alpha falls below this threshold, a review of the questionnaire items will be planned. Additionally, participant responses to open-ended questions will be analysed using artificial intelligence response analysis to identify textual similarities that may contribute to assessing the survey's reliability.

### Recruitment of ambassadors and collaborators

We aim to maximize global participation to ensure a broad dissemination of our survey. Therefore, we will actively seek ambassadors and collaborators who exhibit academic excellence and a strong commitment to the field of sports science. Our professional and academic networks, including connections within the football scientific community, will be utilized to identify talented emerging researchers from various countries. Publishing our research proposal in a reputable scientific journal will be a key recruitment strategy, enhancing the credibility of our research project and making it more appealing to

researchers and experts.

### Survey translation process

A survey may yield reliable results among native language speakers, but its effectiveness among non-native speakers may be compromised (16). To address this concern and enhance inclusivity, the survey will be translated into multiple languages, facilitating participation from diverse linguistic backgrounds. Our comprehensive translation process will involve both forward and back-translation, supervised by the research team. Each language version will involve at least one native speaker and one subject-matter expert. To ensure clarity and ease of understanding, a trial test will be conducted with a small group of potential participants for each language. Feedback received will be thoroughly reviewed, and necessary adjustments to the survey will be made prior to its widespread distribution.

### Data collection

As a cross-sectional, global, web-based survey, data collection will take place through Google Forms. The survey will be launched online for global distribution, with email invitations sent to football clubs, federations, and relevant professional networks worldwide. Various social media platforms, including Facebook, Twitter, and WhatsApp, will be used to increase the survey's visibility and accessibility. Participants will be encouraged to respond, and periodic reminders will be sent to boost participation rates. This digital approach will enable efficient data gathering from a geographically diverse pool of football professionals, ensuring a comprehensive dataset for subsequent analysis.

## Statistical analysis

The collected data will undergo initial cleaning to identify and rectify incorrect or missing items. Descriptive analysis, including percentages, will be employed to present the responses. To address specific research questions, advanced statistical techniques such as regression analyses will be used to examine correlations between survey variables. Hypothesis testing methods, such as analysis of variance, may be employed to compare responses among different participant groups. Cluster analysis methods will be used to identify potential patterns of behaviour or perception by grouping individuals based on similar responses. Additionally, demographic factors such as age, gender, and professional experience will be considered in the analysis. Participant feedback and suggestions will be qualitatively analysed to gain deeper insights into emerging themes. The study's results will be succinctly presented in the discussion section.

## Research timeline

Figure 1 provides a chronological visualization of the key phases of the study's methodology, offering detailed information for each phase.



Figure 1. Visual timeline of study phases.

## RESULTS

The anticipated outcomes of this research study are summarized in Figure 2. These findings, which are expected to have a significant impact on the field of football load monitoring, include i) A thorough overview of worldwide training load monitoring procedures in football, ii) The identification of emerging trends, useful insights for process development, and iii) Actionable recommendations to promote player well-being and performance. Furthermore, this study serves as a basic resource for future research, encouraging continual developments in the field of football load monitoring.



Figure 2. Main study outcomes.

**APPENDIX:** Version of the survey, which was approved by the research team. Available via this URL: <https://zenodo.org/records/10028015>

**Grant support for the research reported.** None.

**Potential and actual conflicts of interest.** No conflicts of interest.

**Acknowledgments:** The authors would like to thank all the experts who participated in reviewing the survey and those who participated in the trial, especially Adam L. Owen (PhD) from the University Claude Bernard Lyon 1, Lyon, France, and Cristoforo Filetti (PhD) from the University of Rome Tor Vergata, Italy. In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT 3.5 (17, 18).

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