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Protocol

Risk factors for hip and groin injuries in male football players: a systematic review protocol

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ABSTRACT

Background: Hip and groin injuries are common among male football players and represent a significant burden due to their frequency, recurrence, and associated time-loss. Despite numerous studies on risk factors, methodological inconsistencies and lack of sport-specific synthesis have limited the development of effective prevention strategies. The aim of this protocol is to conduct a systematic review to identify and evaluate the risk factors associated with hip and groin injuries in male football players.
Methods: This review will be conducted in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines and registered in the International prospective register of systematic reviews (PROSPERO). A comprehensive search will be performed across 7 databases, including Ovid MEDLINE, PubMed, PsycINFO, ScienceDirect, Scopus, SportDiscus, and Web of Science, from inception to June 2025. Studies will be included if they examine risk factors for hip and groin injuries in male football players aged ≥18 years. Two independent reviewers will perform screening, data extraction, and risk of bias assessment using the QUIPS tool. A best-evidence synthesis approach will be used to summarize the strength of evidence for each identified risk factor.
Conclusions: Identifying consistent risk factors for hip and groin injuries in male football players will provide an essential foundation for developing evidence-based and sport-specific prevention strategies in clinical and performance settings.
Trial registration: PROSPERO registration number is CRD420251042372.

Keywords: Hip injuries, Groin injuries, Risk factors, Soccer, Male athletes, Systematic review

INTRODUCTION

Hip and groin injuries are prevalent across a wide range of sports that involve high physical demands such as rapid acceleration and deceleration, sudden directional changes, and repetitive kicking actions.[1-13] In football (soccer), these injuries are particularly common, accounting for approximately 8% to 18% of all reported injuries among players.[4,14-23] According to a UEFA prospective injury study, a hip/groin injury is defined as "Injury located to the hip joint or surrounding soft tissues or at the junction between the anteromedial part of the thigh, including the proximal part of the adductor muscle bellies… leading to a player being unable to fully participate in future training or match play".[4] Data indicate that a professional football team with a 25-player squad typically experiences about

50 time-loss injuries per season, equating to two injuries per player, with groin injuries alone contributing significantly to this burden.[24] Each season, approximately one in five players sustains a time-loss groin injury, leading to an estimated 6 to 7 injuries and around 85 days lost per club.[4,25] Recent epidemiological data show that groin injury incidence ranges from 3.3% to 20% in professional footballers and 3.8% to 14.1% in amateurs.[26] Moreover, recurrence is a substantial concern, as nearly 18% of overuse groin injuries recur within two years, and 11% within just two months.[27,28]

From the above, it is evident that groin injuries represent a significant burden in football, both in terms of incidence and recurrence, underscoring the urgent need for effective injury prevention programs. To reduce the frequency and severity of such injuries, it is essential that clinicians and support staff are able to identify players who are at heightened risk. Central to this process is the identification of risk factors associated with the occurrence of groin injuries, which serves as the foundation for targeted preventive strategies. Effective injury management begins with prevention, which in turn relies on a comprehensive understanding of injury mechanisms.[29] Injury causation models, such as the framework proposed by van Mechelen et al highlight a stepwise approach—starting with the assessment of injury incidence and severity, followed by the identification of contributing risk factors—thus providing a structured basis for the development of evidence-based preventive interventions.[30,31]

Although several previous systematic reviews have investigated hip and groin injuries across a range of field-based sports, the unique physical and biomechanical demands of each sport make it difficult to generalize the findings to football.[6-11] In the context of soccer specifically, existing studies demonstrate notable methodological differences and inconsistencies, contributing to a lack of consensus regarding risk factors. This lack of agreement may have hindered the development and implementation of effective, targeted injury prevention strategies. Among the key limitations is the inconsistent use—or complete absence—of standardized definitions for general injuries or groin strain injuries, with only a small number of studies clearly defining groin injury. Furthermore, variations in how injury incidence is reported, along with the absence of standardized exposure data (e.g., player hours differentiated by training and match play), make meaningful comparisons between studies difficult. Another important consideration is the distinction between professional and amateur populations, as differences in training intensity, physical demands, and medical support may influence both injury patterns and risk factors. Therefore, the present systematic review aims to address these methodological gaps and provide sport-specific insights into the risk factors associated with hip and groin injuries in male soccer players, ultimately contributing to more accurate identification of high-risk individuals and better-informed prevention strategies in sports medicine.

METHODS

This systematic review protocol will be conducted according to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines and registered in the International prospective register of systematic reviews (PROSPERO).[32,33]

Data sources

A comprehensive and systematic literature search was conducted on June 2025, across multiple electronic databases selected for their relevance to the research topic, with no date restrictions. The following electronic databases were used: Ovid MEDLINE, PubMed, PsycINFO, ScienceDirect, Scopus, SportDiscus, and Web of Science.

The search of electronic databases was conducted from their inception to June 2025 by the lead reviewer (KV). In addition to screening the content of the retrieved articles, reference list checking and citation tracking will be performed to identify further relevant studies. This will include screening the bibliographies of all included articles, provided that the studies met the predefined eligibility criteria. Studies that appeared to meet the inclusion criteria based on title and abstract screening will be retrieved in full text and assessed for eligibility. Only those that satisfied the selection criteria will be included in the final review. The Cochrane database of systematic reviews will also be searched to identify existing systematic reviews and/or meta-analyses. The reference lists of these reviews, along with those of all included studies, will be manually searched to identify any additional relevant publications that may have been missed by the initial search strategy.

Search strategy

The search strategy will be reviewed and carried out by the first and second author (KV). A comprehensive approach will be employed, utilizing a combination of medical subject headings (MeSH) and free-text keywords, which will be grouped into thematic categories to ensure broad and systematic coverage of the target population. These terms will be applied independently or in various combinations across multiple databases to identify potentially relevant studies. Additionally, keywords will be drawn from previously published systematic reviews to enhance the sensitivity and robustness of the search process.

All potential references will be imported into Mendeley (Elsevier, Amsterdam, The Netherlands), where duplicates will be identified and removed using the software's built-in deduplication function. Mendeley will also be used to manage, organize, and cite references throughout the manuscript.

The primary keywords that will be used—either individually or in combination—are: “groin”, “hip”, “injuries”, “risk factors”, “soccer”, “football”. These terms will be combined using Boolean operators (“AND”, “OR”) to construct the search queries (Table 1).

Additionally, relevant keywords will be identified and adapted from previously published systematic reviews.[1,6,21,34,35] A detailed description of the search strategy, including the exact keywords and search strings that will be used for each selected database, will be provided in the supplementary materials.

Study selection

Following the database searches, two reviewers (KV and SP) will independently screen the titles and abstracts of all retrieved records according to predefined inclusion and exclusion criteria. Each reviewer will assess whether each study meets the PECOS eligibility criteria (Yes/No/Unclear) and will document their judgments, along with article titles and brief justifications for exclusion where applicable, in a shared data sheet.

To quantify the level of agreement between reviewers during the title and abstract screening phase, Cohen’s Kappa (κ) coefficient will be calculated. A κ value greater than 0.80 will be interpreted as indicating excellent inter-rater reliability beyond chance. High agreement levels will suggest that the eligibility criteria will be clearly defined and consistently applied, whereas lower values will indicate a need for further refinement of the criteria or calibration exercises among reviewers.

Discrepancies between the reviewers will initially be resolved through discussion. In cases where consensus will not be reached, a third reviewer (IAP) will be consulted to make the final determination. Subsequently, the full texts of all studies deemed potentially eligible will be retrieved and independently assessed by the same two reviewers using the same procedure. Discrepancies at the full-text screening stage will again be resolved by discussion or adjudication by the third reviewer if necessary.

Throughout the screening process, initial reviewer decisions and any subsequent consensus discussions will be systematically documented to ensure transparency and reproducibility. Furthermore, the reference lists of all included studies will be manually screened to identify any additional relevant articles.

Data extraction and study rating process

All data from the included studies will be independently extracted, collated by consensus agreement, and entered into a predefined Excel spreadsheet by two reviewers (KV, SP). Specific study information will initially be collected by the first examiner (KV), while the second examiner (SP) will review the extracted data for accuracy. In cases where studies will present incomplete or unclear data, corresponding authors will be contacted for clarification. A response window of two weeks will be provided, considering the demanding academic schedules. If no response is received, the study will be classified as "vague" in terms of data clarity.

From each included study, the following data will be extracted: study design; study location (country) and characteristics of the study population (competition level, age, sample size), as well as match and training exposure. Injury outcomes will be recorded based on the definition provided in each study, alongside injury estimates such as incidence proportion, incidence rate, and prevalence. Measures of risk will be collected, including differences in means, correlation coefficients, odds ratios (OR), incidence rate ratios (IRR), relative risks (RR), hazard ratios, and number of injuries per 1,000 hours of play. When relative risk is not directly reported but sufficient data are available, it will be calculated. Additionally, all risk factors examined in the studies will be noted, and both statistically significant and non-significant results will be documented.

Where sufficient data are available, a meta-analysis will be considered.

However, meta-analysis will only be conducted if sufficient homogeneity is present across study designs, injury definitions, outcome measures, and reported effect sizes. In such cases, pooled estimates (e.g., odds ratios or relative risks) and 95% confidence intervals will be calculated using random-effects models. Statistical heterogeneity will be assessed using the I^2 statistic and interpreted according to established thresholds (e.g., 25% low, 50% moderate, 75% high).

Study selection criteria

The eligibility of studies will be determined according to the population, exposure, comparator, outcome, study design (PECOS) framework, alongside additional criteria related to study design and reporting quality.[36]

Population (P)

Studies will be included if they investigated male football players of any competitive level—professional, semi-professional, or amateur—aged 18 years or older. Studies focusing exclusively on female football players or athletes from other sports will be excluded.

Exposure (E)

Studies will be included if they examined the association between one or more potential risk factors—defined as any factor that may increase the likelihood of hip and/or groin injuries, and the incidence of such injuries in male football players. The definition of hip and groin will follow the “Doha agreement meeting on terminology and definitions in groin pain in athletes”.[37]

Table 1: Categorization of search terms used to identify studies related to hip and groin injuries and associated risk factors in male football players.

S. no.	Categorization of search terms
1	**Population (soccer / football players) and related terms**
	("Soccer" OR "Football" OR "Adult males")
2	**Pathology (hip and groin injuries) and related terms**
	"Groin pain" OR "Groin strain" OR "Osteitis pubis" OR "Rectus abdominis strain" OR "Posterior inguinal wall deficiency" OR "Sports hernia" OR "Hip pain" OR "Hip joint pathology" OR "Femoroacetabular impingement" OR FAI
3	**Risk factors and related terms**
	"Risk factors" OR "Predictors" OR "Associated factors" OR "Determinants" OR "Prevalence" OR "Incidence" OR "Etiology" OR "Aetiology" OR "Cause" OR "Causative factors" OR "Contributing factors" OR "Epidemiology" OR "Exposure" OR "Susceptibility" OR "Risk assessment" OR "Prognostic factors" OR "Correlates" OR "Prognostic markers" OR "Prognostic ability" OR "Predictors" OR "Predicting ability"

Comparator (C)

Studies will be eligible if they included a comparison between the presence and absence of a given risk factor or between varying levels of exposure to a potential risk factor.

Outcome (O)

The primary outcome will be the occurrence of a hip or groin injury sustained during training or match play, as defined by the authors of each included study.

Study design (S)

Prospective and retrospective cohort studies that investigate potential risk factors for hip and groin injuries in adult male football players. Eligible studies must follow an observational, non-interventional cohort design and be conducted over a minimum duration of one full football season. Each study must clearly define the injury outcome using criteria such as time-loss, clinical diagnosis, or functional impairment, and focus specifically on identifying and assessing risk factors, rather than merely reporting injury incidence or evaluating preventive interventions. To be considered relevant, studies must demonstrate temporal precedence—where the proposed risk factor clearly precedes the injury—and apply appropriate statistical analyses using risk estimates such as odds ratios (OR), relative risks (RR), or hazard ratios (HR). Furthermore, the identified factor must be associated with an increased probability of injury, rather than presenting a non-causal correlation. The study population must consist exclusively of adult male football players, either professional or amateur. Studies involving youth athletes, academy-level players, or female participants will not be included.

Additional inclusion criteria

Only studies published in English with full-text availability will be included. Furthermore, only articles published in peer-reviewed journals will be considered.

Exclusion criteria

Cross-sectional, case–control, or other non-cohort designs will be excluded, as they do not permit the temporal assessment required to establish true risk factors. Interventional studies or those focusing primarily on prevention without a detailed analysis of risk factors will also be excluded. Additionally, studies involving participants from sports other than football—such as rugby, Australian Rules Football, Gaelic football, hurling, or field hockey—will not be considered. Research investigating hip or groin pain due to congenital abnormalities, non-sport-related conditions, or other pre-existing pathologies unrelated to football exposure will also be excluded. Studies involving cadavers or animals, as well as unpublished or grey literature—including conference abstracts, systematic or narrative reviews, meta-analyses, case series, commentaries, opinion pieces, editorials, book chapters, or dissertations—will not be included. Lastly, any study that does not clearly define the injury outcome will be excluded from this review.

Risk of bias assessment and methodological quality

The risk of bias (RoB) across included studies will be assessed using the quality in prognostic studies (QUIPS) tool, as recommended by the Cochrane Prognosis Methods Group.[38] The QUIPS tool, which demonstrates moderate to high inter-rater reliability, will be used to evaluate six key domains: study participation, study attrition, prognostic factor measurement, outcome measurement, study confounding, and statistical analysis and reporting.[38,39] Each domain will be independently rated by two reviewers as having low, moderate, or high risk of bias, and color-coded accordingly as green, amber, or red.[38] A point will be awarded for each criterion met, and studies will be classified following previously established methods: those scoring ≥75% of potential points will be deemed to have "low ROB," whereas scores below 75% will be considered "high RoB".[40] Two authors (KV, SP) will independently assess the methodological quality and RoB, discussing discrepancies to reach consensus. Reviewers' ratings will be compared, and consensus for

each item will be determined through discussion. If agreement cannot be reached, a third researcher (IAP) will be consulted. Inter-rater agreement will be calculated using Cohen's kappa coefficient. Finally, a total quality score for each study will be derived by dividing the number of positively rated items by the number of applicable items.

Strength of evidence

The strength of evidence for each identified risk factor will be assessed using a best-evidence synthesis approach, as proposed by Van Tulder et al.[41] This method will take into account the number of available studies, their methodological quality based on risk of bias assessments, and the consistency of their findings. Based on these criteria, the overall level of evidence will be categorized as strong, moderate, limited, conflicting, or no evidence. This classification aims to provide a structured and transparent summary of the robustness of the current literature regarding each prognostic factor.

DISCUSSION

This systematic review protocol outlines a rigorous and comprehensive approach to identifying and synthesizing the risk factors associated with hip and groin injuries in male football players. Given the high incidence, recurrence rates, and performance impact of these injuries, there is a pressing need for sport-specific evidence to inform prevention strategies. Although previous reviews have examined groin-related injuries across multiple sports, they lack specificity to football and are marked by methodological variability, inconsistent injury definitions, and heterogeneous populations. By focusing exclusively on male football players and applying standardized assessment tools and inclusion criteria, this review aims to generate robust and clinically meaningful insights. The results are expected to support clinicians, researchers, and coaching staff in identifying high-risk individuals and developing targeted injury prevention strategies that are grounded in high-quality evidence. Ultimately, this work will contribute to improving player health, reducing time-loss, and optimizing performance outcomes in both professional and amateur football contexts. Importantly, the findings may also assist medical and performance staff in designing individualized screening protocols, tailoring rehabilitation and return-to-play programs, and informing preseason assessments to proactively manage injury risk. Additionally, the synthesis of current evidence may help highlight critical gaps in the literature and guide future longitudinal research aimed at validating specific risk factors and developing predictive models for injury occurrence in football populations.

This protocol demonstrates several methodological strengths. First, unlike previous reviews that included various field-based sports, this review focuses exclusively on football, thereby enhancing the sport-specificity and clinical applicability of its findings. Additionally, the literature search will be conducted across an extensive range of major databases, ensuring comprehensive coverage of the existing evidence base. The planned inclusion of a meta-analysis—contingent on the availability, quality, and comparability of the extracted data—adds further analytical depth and potential for quantitative synthesis. The use of the QUIPS tool for assessing risk of bias is another strength; although it has not been commonly applied in prior systematic reviews of risk factors for sports injuries, it is considered highly appropriate for this context. QUIPS has demonstrated high inter-rater reliability, particularly when applied by trained reviewers using standardized guidance, and is explicitly recommended by the Cochrane prognosis methods group for evaluating prognostic studies. It is a comprehensive, high-validity tool specifically developed for assessing methodological quality in studies of prognostic factors.

Nevertheless, the protocol has some limitations. The exclusion of non-English language studies may introduce language bias, and restricting the search to peer-reviewed articles may limit access to potentially relevant data found in grey literature. Moreover, anticipated heterogeneity in injury definitions, risk factor measurement, and outcome reporting across included studies may limit the feasibility of meta-analysis, in which case a best-evidence qualitative synthesis will be conducted.[42] Despite these limitations, the methodological rigor and focused scope of this review are designed to maximize the validity, transparency, and clinical relevance of its conclusions.

CONCLUSION

In conclusion, hip and groin injuries constitute a substantial and recurring problem in men's football, contributing significantly to player time-loss and performance disruption. Despite the availability of previous research, methodological heterogeneity and a lack of football-specific evidence have hindered the identification of consistent risk factors. This systematic review seeks to address these limitations by critically appraising and synthesizing the existing literature, thereby contributing to the development of evidence-based, sport-specific injury prevention strategies aimed at reducing the burden of hip and groin injuries in male football players.

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