STUDY PROTOCOL

Musculoskeletal disorders in basketball players and associated factors: a systematic review protocol with meta-analysis [version 1; peer review: 1 approved with reservations, 1 not approved]

Silvia Cristina de Carvalho Borges ¹, Michele da Silva Valadão Fernandes², Priscilla Rayanne e Silva Noll^{2,3}, Vinicius Diniz Azevedo¹, Regina Márcia Ferreira Silva², Carolina Rodrigues Mendonça⁴, Matias Noll ^{1,2}

¹Graduate Program in Physical Education, Federal University of Goiás, Goiânia, Goiás, Brazil

²Department of Public Health, Goiano Federal Institute, Ceres, Goiás, Brazil

³Department of Obstetrics and Gynecology, University of Sao Paulo, São Paulo, São Paulo, Brazil

⁴Graduate Program in Health Sciences, Federal University of Goiás, Goiânia, Goiás, Brazil

V1 First published: 12 Jul 2021, 10:557
<https://doi.org/10.12688/f1000research.53177.1>
 Latest published: 12 Jul 2021, 10:557
<https://doi.org/10.12688/f1000research.53177.1>

Abstract

Introduction: Musculoskeletal disorders play an important role in athletes' health and success in sports; they are the main contributors to disability, and back pain is a common problem in athletes. Back pain and spinal injuries occur in players because of the repetitive and unilateral body overload during sports practice. Reviews focused on musculoskeletal disorders in basketball players are scarce in the literature. We describe a systematic review protocol for assessing the prevalence of musculoskeletal disorders and the associated factors in basketball players.

Methods and analysis: The protocol will be based on *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) items and articles will be searched in the databases EMBASE, PubMed, and Scopus. Studies will be included if they are written in English and without restriction regarding the search period. All research stages will be performed by two independent reviewers and will be conducted using Rayyan. Potential disagreements will be analyzed by a third reviewer. The inter-rater reliability will be determined through the Cohen's kappa coefficient. Evidence quality will be ascertained by using the *Grading of Recommendations, Assessment, Development and Evaluations* (GRADE) system, while the Downs and Black checklist will be used for assessing the risk of bias. A descriptive summary and presentation of the characteristics and findings of all included studies will be provided in a table. Regarding these data, if there are sufficient high-quality studies, we plan to perform a meta-analysis.

Open Peer Review

Approval Status

	1	2
version 1		
12 Jul 2021	view	view

1. **Gopal Nambi** , Prince Sattam Bin Abdulaziz University, Alkharj, Saudi Arabia
2. **Antimo Moretti**, University of Campania, "Luigi Vanvitelli", Naples, Italy

Any reports and responses or comments on the article can be found at the end of the article.

Discussion: The obtained results might possibly relate back pain to postural changes in this population. In addition, the data will be compared based on gender and different age groups. It is expected that the results can support the implementation of programs and actions for prevention, ultimately aiming at improving health, quality of life, and sports performance.

Registration: PROSPERO CRD42020201653 on August, 31, 2020.

Keywords

back pain, postural deviations, athletes, basketball

Corresponding authors: Silvia Cristina de Carvalho Borges (silviacristinacb@hotmail.com), Matias Noll (matias.noll@ifgoiano.edu.br)

Author roles: **Cristina de Carvalho Borges S:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Resources, Software, Supervision, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **da Silva Valadão Fernandes M:** Conceptualization, Formal Analysis, Methodology, Software, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing; **Noll PReS:** Conceptualization, Formal Analysis, Methodology, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Diniz Azevedo V:** Conceptualization, Formal Analysis, Investigation, Methodology, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Márcia Ferreira Silva R:** Conceptualization, Formal Analysis, Investigation, Methodology, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Rodrigues Mendonça C:** Conceptualization, Formal Analysis, Investigation, Methodology, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Noll M:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Resources, Software, Supervision, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: The author(s) declared that no grants were involved in supporting this work.

Copyright: © 2021 Cristina de Carvalho Borges S *et al.* This is an open access article distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Cristina de Carvalho Borges S, da Silva Valadão Fernandes M, Noll PReS *et al.* **Musculoskeletal disorders in basketball players and associated factors: a systematic review protocol with meta-analysis [version 1; peer review: 1 approved with reservations, 1 not approved]** F1000Research 2021, 10:557 <https://doi.org/10.12688/f1000research.53177.1>

First published: 12 Jul 2021, 10:557 <https://doi.org/10.12688/f1000research.53177.1>

Introduction

Musculoskeletal disorders and injuries are prevalent throughout life and account for more than 150 diagnoses concerning the locomotor system.^{1,2} These conditions are typically characterized by pain and limitations in mobility, dexterity, and functional capacity. Musculoskeletal disorders are the main contributors to disability worldwide,³ with low back pain being the primary global cause.^{1,4} Furthermore, one in five people suffers from musculoskeletal pain.¹

Pain is an important warning signal for the body that something is wrong,⁵ and back pain is a common problem in athletes.⁶⁻⁹ According to a study of 590 basketball athletes, 12.9% reported low back pain.¹⁰ In many cases, pain can even prevent subjects from performing daily activities.¹ In elite basketball players aged 13-19 years, the prevalence of back pain (49% vs. 28%) and neck pain (42% vs. 20%) is higher in women than men.¹¹ The high prevalence of neck pain and low back pain in basketball players can lead to an increased risk of spinal cord injuries.¹²

On the other hand, lumbar spine injuries are also common in basketball players.¹³ Players of the National Collegiate Athletic Association (NCAA) often have lumbar spine injuries which might cause chronic pain.¹⁴ These injuries account for 11.4% and 13.5% of all injuries in competition and practice, respectively, in college basketball athletes,^{13,15} and for 10.2% of all injuries in the National Basketball Association (NBA) over 17 years.⁸ Postural deviations play an important role in the occurrence of back pain¹⁶ and are common in sportsmen due to the repetitive and unilateral body overload during sports practice.^{17,18}

Considering the above, it is of great importance to know the prevalence of back pain and postural changes in basketball players, since they can affect athletic capacity of athletes by limiting mobility. The hypothesis is that basketball, as an asymmetric sport requiring a repetitive and unilateral overload, such as throwing and repeating each training day, may cause injuries and/or postural changes. Despite the importance of this topic, studies focused on back pain and postural changes in basketball players are scarce in the literature. In this context, the objective of this study was to address the following questions: What is the prevalence of back pain and postural deviations in basketball players? What are the associated factors? Therefore, this article describes a systematic review protocol aimed at assessing the prevalence of musculoskeletal disorders in basketball players and associated factors. We expect that the results of this review can support the implementation of programs and actions for injury prevention or pain treatment, ultimately aiming at improving health, quality of life, and sports performance. This study is both valuable for sports' and players' health.

Methods

Protocol and registration

This study is a systematic review protocol on postural changes and back pain in basketball players. The review will follow the structure of the PECO (Population, Exposure, Comparator, and Outcome) as explained in the recommended systematic review notification items.¹⁹ Therefore, "P", "E", "C", and "O" represent athletes, basketball, gender and age, and prevalence of back pain and postural changes in basketball players, respectively. In this context, back pain will be defined as pain in the cervical, thoracic and/or lumbar areas.²⁰⁻²² Postural changes were considered to have been caused by scoliosis, kyphosis, lordosis and more.

This systematic review protocol will follow the PRISMA (preferred reporting items for systematic reviews and meta-analyses) methodology²³ and the MOOSE (meta-analysis of observational studies in epidemiology) Guidelines.²⁴ The protocol has been registered on PROSPERO (CRD42020201653) on August, 31, 2020. Any changes made to this protocol throughout the study will be reported in PROSPERO and in the final article.

Search strategy and eligibility criteria

Systematic searches will be conducted in the Scopus, PubMed, and EMBASE databases in November 2020 by two independent reviewers (S.C.C.B. and M.S.V.F.). Other manual article searches will be conducted by checking the references of each study eligible for inclusion, as well as searches in Google Scholar.

Studies with the following characteristics will be eligible: a) involving players of both genders aged up to 50 years; b) observational studies (longitudinal and cross-sectional, cohort and case-control), c) musculoskeletal disorder assessments in players (back pain and postural deviations); d) publications in English; and e) studies with players in international communities.

Studies will be excluded under the following criteria: a) studies with basketball players with injuries on other regions of the body (knee, shoulder, hip, ankle); b) Paralympic athletes and/or players with physical or mental disabilities; c) samples including mixed sports, except when data on basketball players are presented separately or can be calculated; and d) experimental studies.

This protocol will include full published articles without restrictions on the search period, and will exclude books, book chapters, case reports, comments, letters, editorials, and duplicate articles. For those articles where the full text cannot be retrieved in online databases, the articles will be requested to libraries or to the study authors via email.

The searches will be adapted according to database. The following search term blocks will be used: ‘musculoskeletal disorders’, ‘athletes and basketball’. The following standard search strategy will be used:

#1	<i>("musculoskeletal disorder" OR "musculoskeletal disorders" OR "musculoskeletal disease" OR "musculoskeletal diseases" OR "musculoskeletal injuries" OR "musculoskeletal injury" OR posture OR "postural evaluation" OR "postural changes" OR scoliosis OR kyphosis OR lordosis OR "back pain" OR "low back pain" OR "back injuries" OR "lumbar pain" OR "neck pain" OR "spinal pain" OR "abnormalities in spine" OR "spine pain" OR "cervical pain" OR backache OR backaches OR "back ache" OR "back aches" OR "cumulative trauma disorders")</i>
#2	<i>(players OR player OR sportsman OR athletes OR athlete OR sportsmen OR sportswoman OR sportswomen)</i>
#3	<i>(basket OR basketball OR sports OR sport)</i>
#4	<i>#1 AND #2 AND #3</i>

Review process

In an independent and consensual manner, two reviewers (S.C.C.B. and M.S.V.F) will conduct the search, selection, and evaluation of study quality. A third reviewer (M.N.) will be consulted in cases of disagreement. The retrieved articles from the databases will be grouped using [Mendeley](#).²⁵ After removing duplicate articles, the initial screening will be performed by reading titles and abstracts using [Rayyan](#),²⁶ excluding those not meeting the eligibility criteria. The remaining articles will be read in full and evaluated for determining their eligibility based on inclusion and exclusion criteria. Lastly, eligible articles will be included in the systematic review. The inter-rater reliability for classifications of individual components will be determined by calculating the percentage of agreement and the Cohen's kappa coefficient.²⁷ The flowchart of this systematic review is depicted in [Figure 1](#).

Figure 1. Flowchart of the selection criteria of the study.

Reviewer training

The authors assessing the eligibility criteria are being trained on the study's inclusion/exclusion criteria and will complete a practice eligibility assessment of 50 test abstracts before starting the review. The authors will also complete a training on risk of bias assessment tools in five non-included articles, in addition to standardized analyses using Mendeley and Rayyan.

Data extraction

Only included studies will be submitted to data extraction by two reviewers (S.C.C.B. and M.S.V.F.), in an independent and consensual manner. Using a standard data extraction spreadsheet, the following information will be extracted: study characteristics (author, year of publication, nationality, study design, and sport); participant characteristics (gender, age group) and results (prevalence, incidence, and assessment tools for back pain and postural changes; and relationship between back pain and postural changes). If data are insufficient, the study authors will be contacted to enquire on availability of complete data.

Risk of bias assessment and quality of evidence

The included articles will be evaluated considering the evidence quality and the methodological quality following the recommendations of GRADE (grading of recommendation, assessment, development and evaluation) and the Downs and Black checklist. GRADE is a methodology implemented for providing transparency and simplicity, since it classifies evidence quality in four categories: very low quality, low quality, moderate quality, and high quality. It is a system widely adopted by organizations worldwide for its rigorous methodological classification and ease of use.²⁸

An adapted version of the Downs and Black²⁹ checklist, proposed by Noll,³⁰ will also be employed. The Downs and Black checklist has been one of the two most employed tools by systematic reviewers in PROSPERO registered reviews from 2011 to 2018.³¹ The studies will be scored, allowing the identification of those with methodological quality, by considering the following five aspects: presentation, external validity, internal validity - bias, internal validity - confusion, and statistical power for inferences.

The risk of bias will be assessed independently by two reviewers. For the data synthesis strategy, the data prevalence found in the studies will be used. In addition to the proposed primary analyses, if sufficient barriers are identified, a comparison between genders and different age groups can be made either in groups or subgroups.

Synthesis and statistical analysis

A descriptive summary and presentation of the characteristics and findings of all included studies will be provided in a table. For general group analysis, the results on prevalence and associated factors will be presented. When possible, differences between genders and age groups will be compared.

Regarding these data, if there are sufficient high-quality studies, we plan to perform a meta-analysis.³² Firstly, we will analyze differences in the prevalence of back pain and postural changes between genders and age groups. Secondly, if possible, we will carry out a meta-analysis with data on the associated factors. The percentage of variability attributable to heterogeneity will be estimated with the I^2 test. I^2 values <40, 40-60, 60-90 and > 90% correspond, respectively, to levels of “unimportant”, “moderate”, “substantial” and “considerable” heterogeneity.³²

Thirdly, publication bias will be assessed using the Egger test³³ and funnel plot. The meta-analysis will be performed using STATA 16.0 (StataCorporation, College Station, TX, USA) with a 95% confidence interval. Publication bias will be assessed by visual inspection of a funnel chart. We plan to present a meta-analysis for back pain and another for postural changes. If meta-analyses are not appropriate, the data will be summarized in a descriptive manner using the synthesis of best evidence.³²

Ethics and dissemination

This systematic review is based on the analysis of published articles (secondary data) and does not require approval by an ethics committee. Upon completion, the systematic review will be sent for publication in a peer-reviewed journal.

Study status

This study is currently at the stage of study selection and data extraction.

Discussion

This systematic review protocol will search for publications on postural changes and back pain in basketball players. It will also analyze the results to relate back pain and postural changes in this population. Moreover, the data will be

compared according to gender and age. It is expected that the results can support the implementation of programs and actions for preventing the injuries caused by postural changes and eventually lead to back pain, ultimately aiming at improving health, quality of life, and sports performance.

Sine limitations may be expected. First, various measurements and tools might lead to varying levels of musculoskeletal disorders and outcomes. Second, a lack of clarity in the definition of musculoskeletal disorders might complicate the comparisons. Third, if no study meets our eligibility criteria, the review will be reported as an “empty review”. However, even an “empty review” is relevant and might help stimulate appropriate future investigations.³⁴

The strengths of this study include assessment of a wide range of musculoskeletal disorders, absence of year restrictions, evaluation of quality and the risk of bias analysis. This systematic review will provide critical insights into the prevalence and associations between musculoskeletal disorders in basketball players that may be important for supporting development of clinical practice guidelines and health programs.

Acknowledgments

We thank the Federal University of Goiás and Institute Federal Goiano for their support.

Authors' contributions

S.C.C.B., M.S.V.F., P.R.S.N., R.M.F.S., V.D.A., C.R.M. and M.N. conceived the idea of the study and contributed to the design of the research. All authors contributed to the writing, editing, and approval of the final protocol.

Data availability

Underlying data

No data are associated with this article.

Reporting guidelines

Figshare: PRISMA-P checklist for ‘Musculoskeletal disorders in basketball players and associated factors: a systematic review protocol with meta-analysis’. <https://doi.org/10.6084/m9.figshare.14899956.v1>.³⁵

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](#) (CC-BY 4.0).

References

1. WHO: **Musculoskeletal Condition** [Internet]. World Health Organization; 2019 [cited 2021 Dec 15].
[Reference Source](#)
2. Vos T, Abajobir AA, Abbafati C, *et al.*: **Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016**. *Lancet*. 2017; **390**(10100).
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
3. Shahrezaee M, Keshtkari S, Moradi-Lakeh M, *et al.*: **Burden of musculoskeletal disorders in Iran during 1990–2017: estimates from the Global Burden of Disease Study 2017**. *Arch Osteoporos*. 2020; **15**(1).
[PubMed Abstract](#) | [Publisher Full Text](#)
4. Blyth FM, Briggs AM, Schneider CH, *et al.*: **The global burden of musculoskeletal pain—where to from here?** *Am J Public Health*. 2019; **109**(1).
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
5. Koehlin H, Locher C, Prchal A: **Talking to Children and Families about Chronic Pain: The Importance of Pain Education—An Introduction for Pediatricians and Other Health Care Providers**. *Children*. 2020; **7**(10).
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
6. Yabe Y, Hagiwara Y, Sekiguchi T, *et al.*: **High prevalence of low back pain among young basketball players with lower extremity pain: A cross-sectional study**. *BMC Sports Sci Med Rehabil* [Internet]. 2020; **12**(1).
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
7. Sheikhhoseini R, Kavianifard M, Nejad S, *et al.*: **Comparison of the Mechanical Energy Transfer of Gait in Female Athletes with and without Non-Specific Chronic Low Back Pain**. *Women's Heal Bull*. 2020; **7**(3): 2–7.
[Publisher Full Text](#)
8. Ball JR, Harris CB, Lee J, *et al.*: **Lumbar Spine Injuries in Sports: Review of the Literature and Current Treatment Recommendations**. *Sport Med - Open*. 2019 Jun; **5**(1): 26.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
9. Pasanen K, Rossi M, Parkkari J, *et al.*: **Low Back Pain in Young Basketball and Floorball Players**. *Clin J Sport Med Off J Can Acad Sport Med*. 2016 Sep; **26**(5): 376–380.
[PubMed Abstract](#) | [Publisher Full Text](#)
10. Hagiwara Y, Yabe Y, Sekiguchi T, *et al.*: **Upper extremity pain is associated with lower back pain among young basketball players: A cross-sectional study**. *Tohoku J Exp Med* [Internet]. 2020; **250**(2): 79–85.
[PubMed Abstract](#) | [Publisher Full Text](#)
11. Sauer J, Berrische G, Schmitt H, *et al.*: **No pain, no gain? Prevalence, location, context, and coping strategies with regard to pain among young German elite basketball players**. *J Hum Kinet* [Internet]. 2019; **69**(1): 179–189.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
12. Farahbakhsh F, Rostami M, Noormohammadpour P, *et al.*: **Prevalence of low back pain among athletes: A systematic review**. *J Back Musculoskelet Rehabil*. 2018; **31**(5): 901–916.
[PubMed Abstract](#) | [Publisher Full Text](#)
13. Zuckerman SL, Wegner AM, Roos KG, *et al.*: **Injuries sustained in National Collegiate Athletic Association men's and women's basketball, 2009/2010-2014/2015**. *Br J Sports Med*. 2018; **52**(4).
[PubMed Abstract](#) | [Publisher Full Text](#)
14. Makovicka JL, Deckey DG, Patel KA, *et al.*: **Epidemiology of Lumbar Spine Injuries in Men's and Women's National Collegiate Athletic Association Basketball Athletes**. *Orthop J Sport Med*. 2019; **7**(10).
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)

15. Dick R, Hertel J, Agel J, *et al.*: **Descriptive Epidemiology of Collegiate Men's Basketball Injuries: National Collegiate Athletic Association Injury Surveillance System, 1988-1989 Through 2003-2004.** *J Athl Train.* 2007; **42**(2): 194-201.
[PubMed Abstract](#) | [Free Full Text](#)
16. Makino T, Kaito T, Sakai Y, *et al.*: **Health-related Quality of Life and Postural Changes of Spinal Alignment in Female Adolescents Associated with Back Pain in Adolescent Idiopathic Scoliosis: A Prospective Cross-sectional Study.** *Spine (Phila Pa 1976).* 2019; **44**(14).
[PubMed Abstract](#) | [Publisher Full Text](#)
17. Grabara M, Hadzik A: **Postural variables in girls practicing volleyball.** *Biomed Hum Kinet.* 2009; **1**.
[Publisher Full Text](#)
18. Wojtys EM, Ashton-Miller JA, Huston LJ, *et al.*: **The association between athletic training time and the sagittal curvature of the immature spine.** *Am J Sports Med.* 2000; **28**(4): 490-498.
[PubMed Abstract](#) | [Publisher Full Text](#)
19. Morgan RL, Whaley P, Thayer KA, *et al.*: **Identifying the PECO: A framework for formulating good questions to explore the association of environmental and other exposures with health outcomes.** *Environ Int.* 2018; **121**.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
20. Beynon AM, Hebert JJ, Leboeuf-Yde C, *et al.*: **Potential risk factors and triggers for back pain in children and young adults. A scoping review, part II: Unclear or mixed types of back pain.** *Chiropr Man Therap.* 2019; **27**.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
21. Beynon AM, Hebert JJ, Hodgetts CJ, *et al.*: **Chronic physical illnesses, mental health disorders, and psychological features as potential risk factors for back pain from childhood to young adulthood: a systematic review with meta-analysis.** *Eur Spine J.* 2020; **29**.
[PubMed Abstract](#) | [Publisher Full Text](#)
22. Noll M, Wedderkopp N, Mendonça CR, *et al.*: **Motor performance and back pain in children and adolescents: A systematic review and meta-analysis protocol.** *Syst Rev.* 2020; **9**(1).
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
23. Moher D, Liberati A, Tetzlaff J, *et al.*: **Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement.** *PLoS Med.* 2009; **6**.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
24. Stroup DF, Berlin JA, Morton SC, *et al.*: **Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group.** *JAMA.* 2000 Apr; **283**(15): 2008-2012.
[PubMed Abstract](#) | [Publisher Full Text](#)
25. Ruiz D: **Manual de Mendeley 2020.** *Biblioteca Universitaria Universidad de Murcia.* 2020: 1-23.
26. Ouzzani M, Hammady H, Fedorowicz Z, *et al.*: **Rayyan-a web and mobile app for systematic reviews.** *Syst Rev.* 2016; **5**(1).
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
27. Stefani L, Galanti G, Padulo J, *et al.*: **Sexual activity before sports competition: A systematic review.** *Front Physiol.* 2016; **7**.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
28. Guyatt GH, Oxman AD, Vist GE, *et al.*: **GRADE: An emerging consensus on rating quality of evidence and strength of recommendations.** *BMJ.* 2008; **336**(7650).
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
29. Downs SH, Black N: **The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions.** *J Epidemiol Community Health.* 1998; **52**(6).
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
30. Noll M, De Mendonça CR, De Souza Rosa LP, *et al.*: **Determinants of eating patterns and nutrient intake among adolescent athletes: A systematic review.** *Nutr J.* 2017; **16**.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
31. Farrah K, Young K, Tunis MC, *et al.*: **Risk of bias tools in systematic reviews of health interventions: an analysis of PROSPERO-registered protocols.** *Syst Rev.* 2019; **8**(1).
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
32. Higgins J, Chandler J, Cumpston M, *et al.*: **Cochrane Handbook for Systematic Reviews of Interventions.** *Cochrane Handbook for Systematic Reviews of Interventions.* 2019.
33. Lin L, Chu H: **Quantifying publication bias in meta-analysis.** *Biometrics.* 2018 Sep; **74**(3): 785-794.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
34. Yaffe J, Montgomery P, Hopewell S, *et al.*: **Empty reviews: a description and consideration of Cochrane systematic reviews with no included studies.** *PLoS One.* 2012; **7**(5): e36626.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
35. Cristina de Carvalho Borges S: **PRISMA-P-checklist.doc, figshare.** *Figure.* 2021.
[Publisher Full Text](#)

Open Peer Review

Current Peer Review Status:

Version 1

Reviewer Report 07 November 2022

<https://doi.org/10.5256/f1000research.56533.r153379>

© 2022 Moretti A. This is an open access peer review report distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Antimo Moretti

Department of Medical and Surgical Specialties and Dentistry, University of Campania, "Luigi Vanvitelli", Naples, Italy

In this paper, authors performed a systematic review protocol with meta-analysis to investigate musculoskeletal disorders in basketball players and associated factors.

General comments: There are several limitations which make the paper unsuitable for indexing in the present form. Better identification of the suitable population must be made (sportsmen, non-agonists, or amateurs.) as well as the age range to be considered. In the introduction, the authors could add epidemiological data about musculoskeletal injuries among the athletic population citing doi: 10.3390/medicina57101118¹.

Most of the references cited referred to adolescents so maybe the age characteristics of the population included must be reviewed.

"Introduction"

- The first sentence is not clear what the authors mean for "150 diagnoses"? Among basketball players?
- The hypothesis that the authors supported is not justified or supported by proper scientific literature, particularly about the basket as an "asymmetric sport requiring a repetitive and unilateral overload"
- In the second question "What are the associated factors ?", what do the authors mean for these? Please describe
- "This study is both valuable for sports' and players' health": There are two populations exposed to different risk factors (training intensity and frequency of competitions) and therefore the evidence and results are not overlapping.

"Methods"

- Several methodological limitations, such as inclusion and exclusion criteria, detailed data extraction, and range of data search.

- The methodological criteria are not reproducible and verifiable by third parties.
- "Postural changes were considered to have been caused by scoliosis, kyphosis, lordosis and more": do the authors mean that scoliosis is a consequence of basketball?
- "Studies with the following characteristics will be eligible: involving players of both genders aged up to 50 years; ": The age cut-off is too high, so specify if you want to study sub-populations of professional competitive sportsmen, non-agonists, or amateurs.

"References"

- Reference no. 1 seems not specific, replace it with a precise one. References 22 and 27 maybe are not appropriate with text contents.

References

1. Gimigliano F, Resmini G, Moretti A, Aulicino M, et al.: Epidemiology of Musculoskeletal Injuries in Adult Athletes: A Scoping Review. *Medicina (Kaunas)*. 2021; **57** (10). [PubMed Abstract](#) | [Publisher Full Text](#)

Is the rationale for, and objectives of, the study clearly described?

Partly

Is the study design appropriate for the research question?

Partly

Are sufficient details of the methods provided to allow replication by others?

No

Are the datasets clearly presented in a useable and accessible format?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: rehabilitation and sport medicine

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 24 October 2022

<https://doi.org/10.5256/f1000research.56533.r153377>

© 2022 Nambi G. This is an open access peer review report distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Gopal Nambi

Department of Health and Rehabilitation Sciences, College of Applied Medical Sciences, Prince Sattam Bin Abdulaziz University, Alkharj, Saudi Arabia

Thank you for giving me this opportunity to review this article. The article is well written, though I have some concerns regarding the article.

Use the mesh keywords.

Abstract:

1. The objective or hypothesis of the study is not clear.
2. Include the character of the study articles.
3. Mention the outcome measures measured for the review.

Manuscript

1. The research question or the gap was not formulated properly with suitable recent references.
2. There are many recent similar articles in MEDLINE and PubMed databases, please justify the need for this review.
3. The database searched for the review is much limited.
4. Mention the duration of the data search.
5. The selection criteria are not specific – include exclusion criteria.
6. Include the outcome measures analyzed for the review.
7. Mention the data extraction procedure in detail.
8. Mention the software used for the statistical analysis.

Is the rationale for, and objectives of, the study clearly described?

No

Is the study design appropriate for the research question?

Yes

Are sufficient details of the methods provided to allow replication by others?

No

Are the datasets clearly presented in a useable and accessible format?

Not applicable

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Musculoskeletal and Sports physiotherapy.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

The benefits of publishing with F1000Research:

- Your article is published within days, with no editorial bias
- You can publish traditional articles, null/negative results, case reports, data notes and more
- The peer review process is transparent and collaborative
- Your article is indexed in PubMed after passing peer review
- Dedicated customer support at every stage

For pre-submission enquiries, contact research@f1000.com

F1000Research