

Musculoskeletal Injuries in CrossFit: A Systematic Review

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Exerc Sport Med 2025;01(1):s00451812871.

Abstract

Introduction CrossFit® applies constantly varied functional movements at high intensity and can improve fitness, yet injury risk remains a concern. This systematic review examined the relationship between CrossFit participation and musculoskeletal injuries in practitioners and athletes.

Methods A systematic search identified 457 records. After screening titles, publication date, and language, 413 were excluded. Of 44 remaining, 30 failed eligibility (9 non-CrossFit populations, 3 conference abstracts, 1 case report, 7 duplicates, 6 systematic reviews, 4 narrative reviews). Fourteen studies were eligible: four met the inclusion criteria for qualitative synthesis. Publication years ranged from 2019 to 2023.

Results Included studies reported a lower proportion of upper- and lower-limb musculoskeletal injuries among participants practicing CrossFit in conjunction with resistance training, suggesting a possible protective effect of combining training modalities. Physiotherapy emerged as central to rehabilitation and secondary prevention among CrossFit practitioners. Comparative distributions of injury by body region across samples showed the following proportions: shoulder (28.7% vs 20.51%), lumbar spine (15.8% vs 19.65%), and knee (8.3% vs 12.82%). These data indicate that the shoulder and lumbar spine are prominent sites of injury, with variability across cohorts.

Conclusion Evidence from recent studies suggests that integrating resistance training with CrossFit and ensuring access to physiotherapy may reduce injury burden and support safe participation. Shoulders and the lumbar spine appear to be the most frequently affected regions. Additional high-quality research is needed to clarify causal pathways, refine prevention strategies, and determine the effectiveness of targeted interventions across different CrossFit populations and training contexts.

Keywords

- crossfit
- injuries
- sports
- sports injuries
- musculoskeletal injury

Introduction

CrossFit has gained popularity as a training program designed to improve overall physical conditioning and promote health. However, this rise in popularity has also brought growing concern regarding injuries associated

with its practice. The CrossFit program is based on principles such as exercise variability, high-intensity training, and functional movements. Its main goal is to enhance various physical capacities of the human body, including cardiorespiratory endurance, strength, power, speed, coordination, flexibility, agility, balance, and accuracy.^{1,2}

received
September 7, 2025
accepted after revision
July 12, 2025

DOI <https://doi.org/10.1055/s-0045-1812871>.
ISSN XXXX-XXXX.

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The inherent demands of CrossFit, particularly its high-intensity and diverse exercise protocols, may predispose participants to a range of injuries. Consequently, understanding and mitigating these risks is critical. Two primary strategies have been emphasized in this context: load management and preventive interventions. Load management involves the careful regulation of training variables such as intensity, duration, and frequency to prevent overtraining and injury. Preventive interventions focus on targeted activities designed to strengthen musculature, enhance flexibility, and correct faulty movement patterns, thereby reducing the likelihood of musculoskeletal injuries.^{3,4}

In response to the significant growth in CrossFit participation worldwide, numerous epidemiological studies have investigated injury patterns related to this modality across diverse geographical regions, including Italy,⁵ Brazil,^{6–9} the Netherlands,¹⁰ Portugal,^{11–12} France,¹³ the United States^{12,14,15} South Africa,¹⁶ Costa Rica,¹⁷ Spain,¹⁸ Greece,¹⁹ among others.^{20,21} However, despite this expanding body of research, there remains a clear need for more comprehensive and standardized data to better characterize the incidence, types, and locations of musculoskeletal injuries in CrossFit practitioners.

In that context, we designed a systematic review to examine the relationship between CrossFit participation and musculoskeletal injuries among both recreational practitioners and competitive athletes. The present study is motivated by the paramount importance of ensuring the health and safety of CrossFit athletes. By elucidating the most prevalent musculoskeletal injuries, their characteristics, and current treatment approaches, this research aims to inform evidence-based prevention strategies. Ultimately, such efforts will support practitioners in safely maximizing the benefits of CrossFit training while minimizing injury risk.

Methods

Protocol and Registration

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines.²² The protocol was prospectively registered on the Open Science Framework (OSF) (DOI: [insert DOI here]) to ensure transparency and reproducibility.

Research Question

Guided by the PICOS framework, we asked: What is the incidence, types, anatomical locations, and treatments of musculoskeletal injuries in individuals practicing CrossFit compared with other exercise modalities, according to randomized and non-randomized controlled studies? Population: individuals practicing CrossFit; Intervention/Exposure: participation in CrossFit training; Comparison: within-population description and, when available, comparisons with other exercise modalities; Outcomes: incidence, type, anatomical location, and treatment of musculoskeletal injuries;

Study design: randomized controlled trials and non-randomized controlled studies.

Eligibility Criteria

Inclusion: Original quantitative, qualitative, or mixed-methods studies addressing musculoskeletal injuries in CrossFit practitioners, in any language and without date limits, with full-text available.

Exclusion: Reviews (systematic or narrative), meta-analyses, case reports, conference abstracts, editorials/letters, and studies not focused on CrossFit practitioners. Reference lists of included studies were hand-searched for additional records.

Information Sources and Search Strategy

A comprehensive search was conducted in PubMed (MEDLINE), Scopus, Embase, and Web of Science Core Collection from inception to January 2024. The strategy combined controlled terms and keywords using Boolean operators: (“CrossFit”) AND (“musculoskeletal injuries” OR “injuries” OR “athletic injuries” OR “high-intensity functional training”). No language or date filters were applied.

Study Selection

Records were imported into Mendeley Desktop v1.19.8; duplicates were removed. Two reviewers independently screened titles/abstracts and then full texts against the eligibility criteria. Disagreements were resolved by discussion or adjudication by a third reviewer. A PRISMA 2020 flow diagram summarizes study selection.

Data Extraction

Two reviewers independently extracted data using a piloted form: author/year; sample size, sex, and age; study design/setting; incidence, type, and anatomical location of injuries; and treatment modalities. Authors were not contacted for missing data.

Quality Assessment

Methodological quality and risk of bias were independently appraised using the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies.¹⁴ Studies meeting ≥50% of criteria were considered acceptable quality; disagreements were resolved by consensus.

Data Synthesis

Given heterogeneity in designs, outcome definitions, and measures, a narrative synthesis was performed. Key outcomes (injury incidence, types, affected regions, and treatments) were summarized to characterize musculoskeletal injuries associated with CrossFit practice.

Results

A total of 457 records were identified; after screening and eligibility assessment, 4 studies were included in this review (►Fig. 1). The included articles were published between 2019 and 2023.

Study Characteristics

Study features are summarized in ►Table 1. Three studies (75%) were retrospective; one (25%) was an epidemiological observational study.^{14,18,19} Three studies collected injury data via online questionnaires, and one used an in-person questionnaire administered to CrossFit practitioners in southern Portugal.¹

Participant Characteristics

Across studies, 2,562 CrossFit practitioners and athletes were included (1,640 men; 922 women), aged 18–59 years. Per-study sample sizes by sex ranged from 183 to 1,224 participants.

Injury Incidence

Reported incidence rates of musculoskeletal injury were 78.0%, 44.0%, 74.0%, and 39.0%, respectively^{11,14,18} corresponding to ~3.6 injuries per 1,000 hours of exposure.

Nature, Type, and Location of Injuries

The most frequently affected region was the scapulohumeral (shoulder) complex (29.1%, $n = 30$), followed by the back (17.5%) and the knee (15.5%).¹⁸ By diagnosis, muscle injuries (51.3%) and tendinopathies (49.6%) predominated, followed by joint injuries (26.6%), mainly involving the shoulder (31.4%), lumbar region (18.3%), and knee (17.4%).¹⁹

Injury Treatment

Surgical management was infrequently required. Most studies reported physiotherapy as the primary treatment, followed by medication and alternative therapies.

Study Quality and Limitations

All included studies met at least 50% of STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) criteria, indicating acceptable reporting yet underscoring

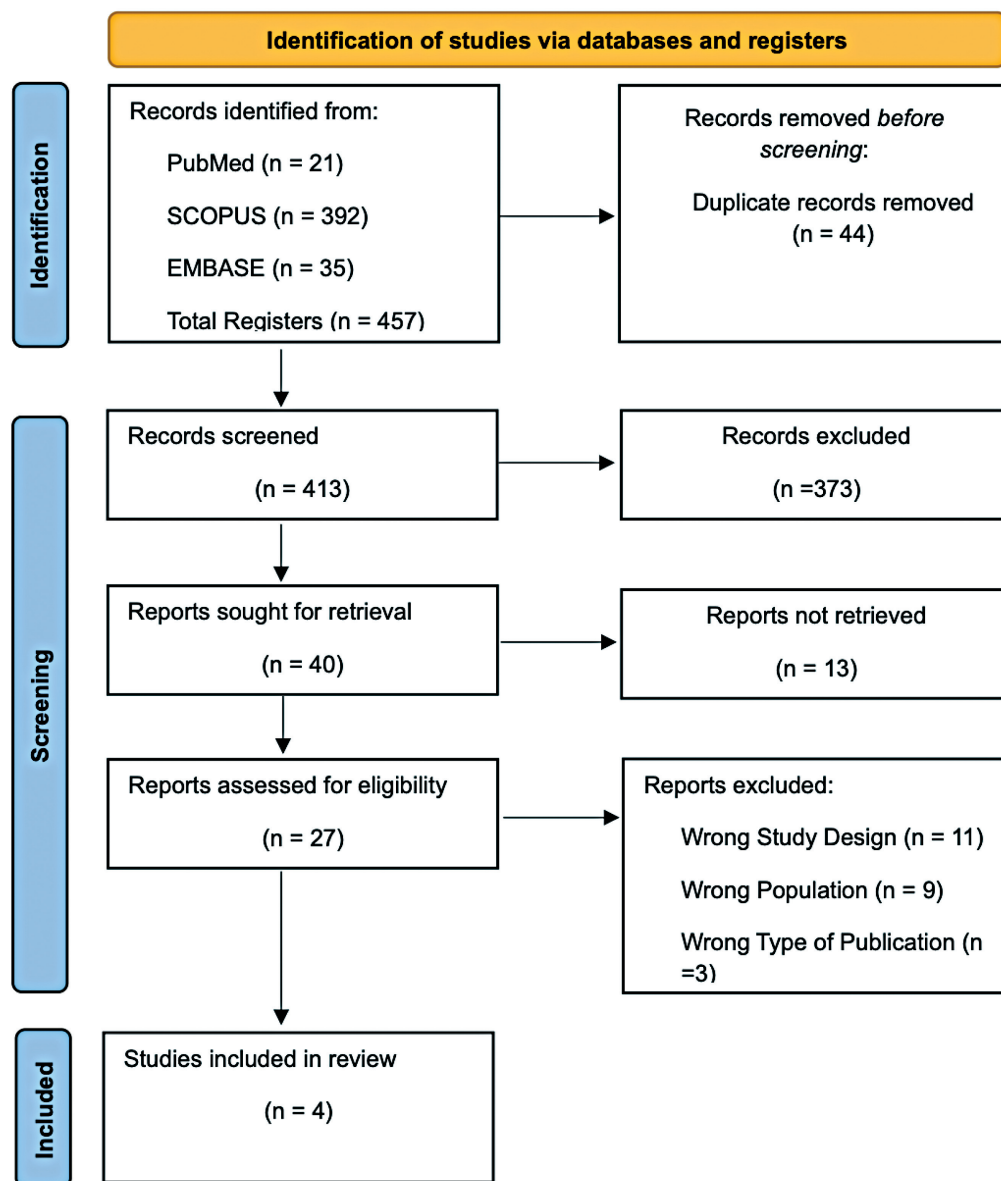


Fig. 1 Prisma Flowchart Diagram for study identification and selection.

Table 1 CrossFit®-related musculoskeletal injuries: summary of included studies

Study	Design	Sample	Age (y)	Aim	Predominant MSK injury types	Most frequent sites	Common treatments	Key conclusion
Lastra-Rodríguez et al., ¹⁸ 2023	Cross-sectional, retrospective	n = 183 (M = 118; W = 65)	≥18	Examine relationship between CrossFit® and MSK injuries	Not reported	Shoulder complex; back; knee	Physiotherapy; pharmacologic; alternative therapies	Injuries often mild/short duration; shoulder most affected; prioritize movement-pattern screening and graded progressions.
Vassil et al., ¹⁹ 2022	Observational, descriptive epidemiological	n = 1,224 (M = 781; W = 443)	18–59	Identify common MSK injuries in CrossFit®	Muscle injuries; tendinopathies; joint injuries	Shoulder; knee; lumbar spine	Physiotherapy; pharmacologic; injections; surgery	Improve identification of common injuries and risk factors to guide prevention.
Alekseyev K et al., ¹⁴ 2020	Cross-sectional, retrospective	n = 885 (M = 589; W = 296)	Mean 29	Identify common MSK injuries across specialization levels	Not reported	Back; shoulder	Physiotherapy; injections; surgery	Standardized exercise regimens may reduce CrossFit®-related injuries.
Minghelli & Vicente, ¹¹ 2019	Cross-sectional, retrospective	n = 270 (M = 152; W = 118)	15–53	Determine injury epidemiology and risk factors (Portugal)	Joint injuries; muscle injuries	Shoulder; thigh; leg	Physiotherapy; pharmacologic; alternative therapies	Further studies needed to expand knowledge and prevention strategies.

the need for more detailed methodological descriptions. Heavy reliance on self-reported injuries raises concerns about response accuracy and highlights the need to develop and validate population-specific instruments. Most studies were retrospective, and few provided detailed accounts of treatment approaches. Prospective studies are recommended to better evaluate interventions and treatment strategies among CrossFit practitioners and to strengthen causal inference in this field.

Discussion

This systematic review highlights several key findings regarding the epidemiology of musculoskeletal injuries in CrossFit practitioners. One of the most noteworthy results is the lower incidence of upper and lower limb injuries among participants who engaged in CrossFit alongside resistance training (RT). This suggests a possible protective effect from combining modalities, potentially due to improved muscular strength, joint stability, and movement control developed through RT. These findings emphasize the importance of multimodal training strategies in injury prevention.

Furthermore, a significant proportion of participants reported CrossFit as their initial sport, indicating a trend toward its adoption as a first-choice physical activity. This trend may reflect the appeal of its structured, high-intensity, and community-based nature. The injury prevalence found in the reviewed studies is consistent with previously published literature, reinforcing the reliability of these findings across different populations and study designs.^{6,8,9}

It is important to acknowledge the methodological heterogeneity present in epidemiological studies on sports injuries. Despite this, our study adopted selection and evaluation criteria aligned with prior research to enhance comparability and contextual accuracy. This methodological alignment strengthens the validity of our conclusions and supports the synthesis of comparable data across different populations.

Injury Treatment and the Role of Physiotherapy

Physiotherapy emerged as a central component in both the rehabilitation and prevention of musculoskeletal injuries associated with CrossFit. Its relevance lies not only in post-injury care but also in proactive measures aimed at enhancing biomechanical efficiency, correcting movement patterns, and reducing re-injury risk. The complexity and high intensity of CrossFit routines demand individualized and sport-specific approaches, reinforcing the value of physiotherapists within this context. The study by Silva et al.⁴⁰ supports the growing body of evidence advocating for physiotherapy's role in sports medicine, particularly for functional training modalities like CrossFit.

Other complementary therapeutic modalities—such as manual therapy, dry needling, and joint mobilization—have also been shown to be effective in managing musculoskeletal injuries.^{33,41–43} These should be considered as part of a

multidisciplinary approach to both recovery and performance enhancement.

Injury Distribution and Affected Regions

Our findings confirm that the most injured regions among CrossFit practitioners are the shoulder complex (scapulo-humeral joint) and the lumbar spine. This agrees with previous studies, including that of Mehrab et al.,¹⁰ who reported similar rates of shoulder (28.7% vs. 20.51%) and lumbar spine injuries (15.8% vs. 19.65%). Despite slight variations, the convergence of data across studies reinforces the need for targeted preventive measures for these anatomical regions.

Weightlifting movements, which are integral to CrossFit, appear to significantly contribute to shoulder-related injuries. The reported incidence of shoulder injuries in our review (29.1%) aligns with findings from weightlifting-focused studies,^{27,28} and is comparable to reports by Weisenthal et al.²⁹ and Hak et al.³⁰ Such consistency supports the hypothesis that the technical demands and repetitive load associated with Olympic lifts and overhead movements are key risk factors.

Injury prevalence across studies varied widely—ranging from 19.4% to 73.5%—highlighting the complexity and variability of musculoskeletal injury patterns within CrossFit.³¹ These discrepancies may be explained by differences in population characteristics, injury definitions, study design, and training environments. Nevertheless, the average injury rate observed in our sample (56.6%) is consistent with rates reported in other high-intensity sports. For example, Wan Gent et al.³² found lower limb injury rates among long-distance runners ranging from 19.4% to 79.3%, demonstrating that injury heterogeneity is not exclusive to CrossFit.

Risk Factors and Preventive Strategies

One important observation is that injury risk persists even among experienced male athletes, suggesting that familiarity with the sport does not inherently protect against injury. Particular caution is advised during exercises that place high stress on the shoulder girdle and lumbar spine, such as Olympic lifts, kipping pull-ups, and deadlifts. Technical precision, load management, and individualized coaching are critical for injury prevention.

Systematic reviews have previously explored risk factors in CrossFit and provided foundational evidence for the present review.^{1,33–39} Building on this literature, our findings support several practical recommendations, such as : Incorporating isometric exercises during warm-up routines to enhance neuromuscular activation and joint stability; Promoting early cessation of training in the presence of acute pain to prevent the progression of minor injuries; Encouraging load progression strategies tailored to individual capacity and experience level.

Need for Standardized Definitions and Methodology

A key limitation in the current literature is the absence of a standardized definition of injury within CrossFit-related studies. Most studies used heterogeneous criteria and data

collection methods, which complicates cross-study comparisons and may distort prevalence rates. We echo calls for the establishment of standardized definitions and reporting protocols, similar to those developed in soccer and other well-studied sports. Such standardization would enable more robust data synthesis, meta-analyses, and ultimately, evidence-based recommendations for injury prevention and management.

Limitations and Strengths

A major strength of this review is its adherence to the PRISMA guidelines, ensuring a transparent and methodologically rigorous approach. Additionally, the prospective registration of the review protocol reflects a strong commitment to scientific integrity, reproducibility, and accountability.

Our systematic synthesis incorporates levels of evidence and presents a comprehensive overview of the current literature on musculoskeletal injuries in CrossFit. The study's focus on injury incidence, affected regions, treatment modalities, and associated risk factors allows for a multidimensional understanding of the issue, offering practical implications for clinicians, trainers, and athletes.

Despite the relatively small number of included studies, the consistency of findings across investigations adds to the robustness and generalizability of our conclusions. This review contributes meaningfully to identifying current gaps in the literature and sets the foundation for future research.

However, some limitations must be acknowledged. The limited number of high-quality studies available for inclusion restricts the scope of the review and hinders the ability to draw definitive conclusions. Moreover, most included studies relied on self-reported data, which may introduce recall bias and reduce the accuracy of injury classification and severity reporting.

Another limitation is the variability in study design and injury definitions, which affects comparability across studies. The lack of standardized outcome measures and the predominance of retrospective observational designs reduce the capacity to infer causality.

Lastly, the review did not perform a meta-analysis due to the heterogeneity in methodologies and outcome reporting among included studies. Future research should aim to address these gaps through prospective cohort studies, standardized injury definitions, and detailed reporting on injury mechanisms, severity, and treatment outcomes.

Conclusion

This systematic review provides a comprehensive analysis of musculoskeletal injuries among CrossFit practitioners, highlighting the high prevalence of injuries, particularly in the shoulder complex and lumbar spine. The findings underscore the importance of targeted preventive strategies and emphasize the critical role of physiotherapy in both rehabilitation and injury prevention. Future research should focus

on prospective designs, unified injury criteria, and tailored therapeutic approaches to enhance safety and promote sustainable participation in CrossFit. Ultimately, fostering collaboration between health professionals and athletes is essential to optimizing performance while minimizing injury risk in this growing sport.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest

There is no conflict of interest to declare.

References

- 1 Claudino JG, Gabbett TJ, Bourgeois F, et al. CrossFit Overview: Systematic Review and Meta-analysis. *Sports Med Open*. 2018;4(01):11
- 2 Lima PO, Souza MB, Sampaio TV, Almeida GP, Oliveira RR. Epidemiology and associated factors for CrossFit-related musculoskeletal injuries: a cross-sectional study. *J Sports Med Phys Fitness*. 2020;60(06):889–894
- 3 Coyne JOC, Coutts AJ, Newton RU, Haff GG. The Current State of Subjective Training Load Monitoring: Follow-Up and Future Directions. *Sports Med Open*. 2022;8(01):53
- 4 Eustaquio JMJ, Pires VP, Prado RP, Naito JT, Vilela LS, Neto OB. Is resistance training a protective factor for musculoskeletal injuries in crossfit practitioners? *Rev Bras Med Esporte*. 2024;30(12):1–4
- 5 Tafuri S, Salatino G, Napoletano PL, Monno A, Notarnicola A. The risk of injuries among CrossFit athletes: an Italian observational retrospective survey. *J Sports Med Phys Fitness*. 2019;59(09):1544–1550
- 6 Sprey JWC, Ferreira T, de Lima MV, Duarte A Jr, Jorge PB, Santili C. An Epidemiological Profile of CrossFit Athletes in Brazil. *Orthop J Sports Med*. 2016;4(08):2325967116663706
- 7 de Almeida Xavier A, da Costa Lopes AM. Lesões Musculoesqueléticas Em Praticantes de Crossfit. *Rev Interdiscip Cienc Med*. 2017;1(19):11–27
- 8 da Costa TS, Louzada CTN, Miyashita GK, et al. CrossFit®: Injury prevalence and main risk factors. *Clinics (Sao Paulo)*. 2019;74:e1402
- 9 Szeles PRQ, da Costa TS, da Cunha RA, et al. CrossFit and the Epidemiology of Musculoskeletal Injuries: A Prospective 12-Week Cohort Study. *Orthop J Sports Med*. 2020;8(03):2325967120908884
- 10 Mehrab M, de Vos R-J, Kraan GA, Mathijssen NMC. Injury Incidence and Patterns Among Dutch CrossFit Athletes. *Orthop J Sports Med*. 2017;5(12):2325967117745263
- 11 Minghelli B, Vicente P. Musculoskeletal injuries in Portuguese CrossFit practitioners. *J Sports Med Phys Fitness*. 2019;59(07):1213–1220
- 12 Montalvo AM, Shaefer H, Rodriguez B, Li T, Epnere K, Myer GD. Retrospective injury epidemiology and risk factors for injury in CrossFit. *J Sports Sci Med*. 2017;16(01):53–59
- 13 Gile M, Petit J, Gremaux V. Évaluation du Taux de Blessures Chez les Praticants de CrossFit en France. *J Traumatol Sport*. 2020;37:2–9
- 14 Alekseyev K, John A, Malek A, et al. Identifying the Most Common CrossFit Injuries in a Variety of Athletes. *Rehabil Process Outcome*. 2020;9:1179572719897069
- 15 Feito Y, Burrows EK, Tabb LP. A 4-year analysis of the incidence of injuries among CrossFit-trained participants. *Orthop J Sports Med*. 2018;6(10):2325967118803100
- 16 Silva C. A Profile of Injuries Among Participants at the 2013 CrossFit Games in Durban. Master's Thesis, Chiropractic Durban University of Technology, Berea, South Africa; 2013

- 17 Escalante G, Gentry CR, Kern BD, Waryasz GR. Injury Patterns and Rates of Costa Rican CrossFit® Participants-a Retrospective Study. *J Rom Sports Med Soc.* 2017;XIII:2927–2934
- 18 Lastra-Rodríguez L, Llamas-Ramos I, Rodríguez-Pérez V, Llamas-Ramos t R, López-Rodríguez AF. Musculoskeletal Injuries and Risk Factors in Spanish CrossFit. *Healthcare (Basel)* 2023;11(9)
- 19 Vassis K, Siouras A, Kourkoulis N, et al. Epidemiological Profile among Greek CrossFit Practitioners. *Int J Environ Res Public Health.* 2023;20(03):2538
- 20 Lima PO, Souza MB, Sampaio TV, Almeida GP, Oliveira RRJ. Epidemiology and associated factors for CrossFit-related musculoskeletal injuries: a cross-sectional study. *J Sports Med Phys Fitness.* 2020;60(06):889–894
- 21 Szajkowski S, Dwornik M, Pasek J, Cieslar G. Risk factors for injury in CrossFit® – A retrospective analysis. In *J Environ Res Public Health.* 2023;20(03):2211
- 22 Page MJ, McKenzie JE, Bossuyt PM, et al. A declaração PRISMA 2020: uma diretriz atualizada para relatar revisões sistemáticas. *BMJ.* 2021;372(71):. Doi: 10.1136/bmj.n71 Para mais informações visite
- 23 Elkin JL, Kammerman JS, Kunselman AR, Gallo RA. Likelihood of injury and medical care between CrossFit and traditional weightlifting participants. *Orthop J Sports Med.* 2019;7(05): 2325967119843348
- 24 Hopkins BS, Cloney MB, Kesavabhotla K, et al. Impact of CrossFit-Related Spinal Injuries. *Clin J Sport Med.* 2019;29(06):482–485
- 25 Serafim TT, Maffulli N, Migliorini F, Okubo R. Epidemiology of High Intensity Functional Training (HIFT) injuries in Brazil. *J Orthop Surg Res.* 2022;17(01):522–527
- 26 Kemler E, Noteboom L, van Beijsterveldt AM. Characteristics of Fitness-Related Injuries in The Netherlands: A Descriptive Epidemiological Study. *Sports (Basel).* 2022;10(12):187
- 27 Keogh J, Hume PA, Pearson S. Retrospective injury epidemiology of one hundred one competitive Oceania power lifters: the effects of age, body mass, competitive standard, and gender. *J Strength Cond Res.* 2006;20(03):672–681
- 28 Siewe J, Rudat J, Rölinghoff M, Schlegel UJ, Eysel P, Michael JW. Injuries and overuse syndromes in powerlifting. *Int J Sports Med.* 2011;32(09):703–711
- 29 Weisenthal BM, Beck CA, Maloney MD, DeHaven KE, Giordano BD. Injury Rate and Patterns Among CrossFit Athletes. *Orthop J Sports Med.* 2014;2(04):2325967114531177
- 30 Hak PT, Hodzovic E, Hickey B. The nature and prevalence of injury during CrossFit training. *J Strength Cond Res* 2013
- 31 Moran S, Booker H, Staines J, Williams S. Rates and risk factors of injury in CrossFitTM: a prospective cohort study. *J Sports Med Phys Fitness.* 2017;57(09):1147–1153
- 32 van Gent RN, Siem D, van Middelkoop M, van Os AG, Bierma-Zeinstra SMA, Koes BW. Incidence and determinants of lower extremity running injuries in long distance runners: a systematic review. *Br J Sports Med.* 2007;41(08):469–480, discussion 480
- 33 Klimek C, Ashbeck C, Brook AJ, Durall C. Are injuries more common with CrossFit training than other forms of exercise? *J Sport Rehabil.* 2018;27(03):295–299. Doi: 10.1123/jsr.2016-0040
- 34 Tibana RA, de Sousa NMF. Are extreme conditioning programmes effective and safe? A narrative review of high-intensity functional training methods research paradigms and findings. *BMJ Open Sport Exerc Med.* 2018;4(01):e000435
- 35 Claudino JG, Gabbett TJ, Bourgeois F, et al. CrossFit overview: Systematic review and meta-analysis. *Sports Med Open.* 2018;4(01):11. Doi: 10.1186/s40798-018-0124-5
- 36 Dominski FH, Siqueira TC, Serafim TT, Andrade A. Perfil de lesões em praticantes de CrossFit: revisão sistemática. *Fisioter Pesqui.* 2018;25:229–239
- 37 Gianzina E, Kassotaki O. The benefits and risks of the high intensity CrossFit training. *Sport Sci Health.* 2019;15:21–33. Doi: 10.1007/s11332-018-0521-7
- 38 Gean RP, Martin RD, Cassat M, Mears SC. A systematic review and meta-analysis of injury in CrossFit. *J Surg Orthop Adv.* 2020;29(01):26–30
- 39 das Graças D, Nakamura L, Barbosa FSS, Martinez PF, Reis FA, Oliveira-Junior SA. Could current factors be associated with retrospective sports injuries in Brazilian jiu-jitsu? A cross-sectional study. *BMC Sports Sci Med Rehabil.* 2017;9:16
- 40 Silva AA, et al. Análise do perfil funções e habilidades do fisioterapeuta com atuação na área esportiva nas modalidades de futebol e vôlei no Brasil. *Rev Bras Fisioter.* 2011;15(03):219–226
- 41 Meyer J, Morrison J, Zuniga J. The benefits and risks of CrossFit: a systematic review. *Workplace Health Saf.* 2017;65(12):612–618. Doi: 10.1177/2165079916685568
- 42 Pereira DS, Santana Júnior V. Efeito da Terapia Manual em Pacientes com Lombalgia: Uma Revisão Integrativa. *Id on Line Rev Mult Psic.* 2018;12(41):31–38. ISSN 1981-1179
- 43 Araújo CAB, et al. Eficácia do tratamento com terapia manual comparada a outros métodos para dor em pacientes com síndrome do impacto do ombro. *Revista UNILUS Ensino e Pesquisa.* • Vol. 11 • N°. 22 • Ano 2014 • 96