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**PREVALÊNCIA DE LESÕES POR *OVERUSE* EM ATLETAS  
DE DIFERENTES MODALIDADES ESPORTIVAS:**

uma revisão sistemática com meta-análise

**Belo Horizonte**

**Escola de Educação Física, Fisioterapia e Terapia Ocupacional / UFMG**

**2020**

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Trabalho de Conclusão de Curso apresentado à Graduação em Fisioterapia, da Escola de Educação Física, Fisioterapia e Terapia Ocupacional (EEFFTO) da Universidade Federal de Minas Gerais (UFMG), como requisito à obtenção de título de Bacharel em Fisioterapia.

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## **PREFÁCIO**

A presente monografia apresenta quatro partes. A primeira parte é composta da introdução, em que é realizada uma revisão bibliográfica, problematização do tema e justificativa. A segunda parte desta monografia consiste na descrição detalhada dos materiais e método utilizados. A terceira parte contém o artigo desenvolvido, o qual foi elaborado de acordo com as regras do periódico *Brazilian Journal of Physical Therapy* (ISSN 1809-9246). Por fim, são apresentadas as considerações finais da monografia.

## RESUMO

Lesões por *overuse* são definidas como lesões sem um evento específico e identificável associado ao seu início. Esse tipo de lesão resulta de um processo cumulativo de dano tecidual, em vez de transferência instantânea de energia, que causa um microtrauma repetitivo e sobrecarga no sistema musculoesquelético. Estudos prévios demonstraram que a prevalência geral de lesões por *overuse* vem apresentando resultados crescentes onde, considerando a alta demanda de treinamento e da prática esportiva a qual os atletas estão inseridos, existe a hipótese de que a prevalência em esportes individuais seja maior do que em esportes coletivos. Assim, o presente estudo constituiu de uma revisão sistemática com meta-análise cujo objetivo foi investigar a prevalência geral de lesões por uso excessivo. Além disso, também relatamos a prevalência de lesões por *overuse* para esportes individuais e coletivos. Foram realizadas estratégias de buscas eletrônicas nos bancos de dados MEDLINE, EMBASE, SPORTDiscus e CINAHL, desde o primeiro registro até março de 2020, além das pesquisas manuais. Dezenove estudos foram incluídos, depois de passarem pelos critérios de inclusão e exclusão estabelecidos em comum acordo entre os autores. Análises descritivas foram utilizadas para descrever os dados. A meta-análise foi realizada quando os dados gerados apresentaram uma homogeneidade suficiente e, além disso, o sistema GRADE foi usado para resumir a qualidade geral das evidências. Todas as análises estatísticas foram realizadas no Comprehensive Meta-Analysis Software version 2.2.04 (Biostat, Inc.©, Englewood, New Jersey). Foi demonstrado que a prevalência geral foi de 46,0% (IC 95% 37,0 a 55,0). Além disso, a prevalência de lesões por *overuse* em atletas de esportes individuais e coletivos foi de 58,0% (IC 95% 51,0 a 65,0) e 37,0% (IC 95% 26,0 a 50,0), respectivamente. A qualidade geral das evidências foi classificada como de baixa qualidade. Considerando os resultados encontrados, observou-se alta prevalência geral de lesões por *overuse* nos esportes. Além disso, os esportes individuais apresentaram maior prevalência de lesões por uso excessivo do que os esportes coletivos. Atletas, clínicos, equipes esportivas e formuladores de políticas devem estar cientes da alta prevalência de lesões por *overuse* em atletas, mas principalmente em atletas de esportes individuais. As evidências atuais de baixa qualidade mostram que estudos futuros de alta qualidade provavelmente terão impacto na prevalência estimada.

**Palavras Chave:** Epidemiologia. Distúrbio de trauma cumulativo. Lesões esportivas.

Agrupamento de dados.

## ABSTRACT

Overuse injuries are defined as injuries without a specific and identifiable event associated with their onset. They result from the cumulative process of tissue damage rather than instantaneous energy transfer, which causes a repetitive microtrauma and overload in the musculoskeletal. Previous studies have shown that the overall prevalence of overuse injuries has grown in recent years where, considering the high demand for training and sports practice in which athletes are inserted, there is a hypothesis that the prevalence in individual sports is higher than in team sports. Thus, the present study constituted a systematic review with meta-analysis aimed to investigate the overall prevalence of overuse injuries. In addition, we also reported the prevalence of overuse injuries for individual and team sports. Electronic database searches were performed from the earliest record to March 2020 using MEDLINE and EMBASE (via OvidSP), SPORTDiscus and CINAHL (via EBSCO), besides the hand searching. Nineteen studies were included after passing the inclusion and exclusion criteria established by common agreement between the authors. Descriptive analyzes were used to describe the data. The meta-analysis was performed when the data generated presented sufficient homogeneity and, in addition, the GRADE system was used to summarize the general quality of the evidence. All statistical analyzes were performed in Comprehensive Meta-Analysis Software version 2.2.04 (Biostat, Inc. ©, Englewood, New Jersey). It has been shown estimated the overall prevalence of 46.0% (CI 95% 37.0 to 55.0). Moreover, the prevalence of overuse injuries in athletes of individual and team sports were 58.0% (CI 95% 51.0 to 65.0) and 37.0% (CI 95% 26.0 to 50.0), respectively. Overall quality of evidence was rated as low-quality. Overall prevalence of overuse injuries in sports is extremely high. In addition, individual sports showed higher prevalence of overuse injuries than team sports. Athletes, clinicians, sport teams, and policymakers should be aware of the high prevalence of overuse injuries in athletes, but especially in athletes from individual sports. Current low-quality evidence shows that future high-quality studies are likely to impact on the estimated prevalence.

**Keywords:** Epidemiology. Cumulative trauma disorder. Athletic injuries. Data pooling.

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## 1 INTRODUÇÃO

As lesões esportivas podem ser definidas como qualquer queixa física sustentada por um atleta proveniente de um treinamento e participação esportiva, independentemente da necessidade de atenção médica ou afastamento das atividades<sup>1</sup>. As lesões por *overuse* são definidas como aquelas que se apresentam de maneira gradual, resultantes de processos cumulativos de danos aos tecidos como, ossos, músculos, tendões e/ou ligamentos<sup>2,3,4</sup>. Esses processos cumulativos podem originar microtraumas no tecido acometido decorrente de demandas repetitivas, o que não resultaria necessariamente em lesão caso fosse permitido ao tecido tempo necessário para recuperação entre as atividades<sup>5,6</sup>. Assim, as lesões por *overuse* podem levar a sérias consequências para o desempenho esportivo e para a saúde do atleta, podendo causar dor e disfunção e, em alguns casos, podendo culminar no término da carreira esportiva<sup>7,8</sup>.

Revisões anteriores sobre a prevalência geral de lesões por *overuse* nos membros superiores e inferiores de jovens atletas, demonstraram altas taxas de prevalência variando de 32% a 75% entre diferentes modalidades esportivas como, por exemplo, ginástica, tênis, remo e triatlo. Além disso, entre articulações, a prevalência de lesões por *overuse* pode variar de 10% a 28% para lesões no punho e 18,5% para lesões no complexo do tornozelo<sup>9,10</sup>. Somado a isso, um estudo realizado com atletas dos Jogos Paralímpicos de 2016, o qual abordou a lesão por estresse ósseo como uma das lesões por *overuse*, demonstrou uma prevalência geral de 5,7% a 22,8% entre diferentes articulações dos membros superiores e inferiores<sup>11</sup>. No handebol, por exemplo, Aasheim *et al.*<sup>13</sup> relataram uma prevalência média de 39% de todas as lesões por *overuse* nos jogadores, sendo o ombro (17%) a articulação mais afetada devido à exposição de movimentos de arremesso em alta velocidade. Nesse sentido, esportes que envolvam gestuais esportivos de arremessos, por exemplo, podem propiciar aos atletas o desenvolvimento de alterações patológicas em articulações como cotovelo e ombro, sendo essas alterações resultados de estresses repetitivos anormais<sup>14</sup>. Sendo assim, as lesões por *overuse* ocupam um significativo espaço em diferentes modalidades esportivas que requerem, por exemplo, movimentos repetitivos<sup>12</sup>. Portanto, a avaliação e mensuração regulares desse tipo de lesão tem recebido mais reconhecimento, com o intuito de proteger a saúde dos atletas.<sup>12</sup>

A prevalência de lesões por *overuse* nos atletas pode ser influenciada pelo volume de treinamento e pela especialização esportiva que variam de acordo com o tipo de esporte (individual ou coletivo)<sup>15,16</sup>. Sendo assim, ao comparar esses tipos de esporte, um estudo

anterior<sup>17</sup> demonstrou que as lesões por *overuse* foram mais prevalentes em esportes individuais (24.0%) do que nos coletivos (8.0%). Esse resultado pode ser explicado devido aos atletas de esportes individuais iniciarem a prática esportiva mais cedo e relatarem maiores volumes de treinamento do que os atletas de esportes coletivos<sup>16</sup>. Além disso, atletas especializados no esporte individual apresentaram uma maior proporção de lesões por *overuse* (44,3% vs 32,2%, OR = 1,67) e lesões graves por *overuse* (23,4% vs 11,6%, OR = 2,38), ao contrário das lesões agudas, onde a proporção foi menor (13,8% vs 28,8%, OR = 0,37)<sup>16</sup>. Outro fator contribuinte para a maior prevalência em esportes individuais se refere aos atletas serem submetidos a um regime de treinamento altamente repetitivo<sup>18</sup>, o que pode resultar em danos cumulativos nos tecidos sem tempo para recuperação e, conseqüentemente, em lesões por *overuse*. Assim, o tipo e a demanda específica de cada modalidade esportiva podem ajudar a explicar os diferentes valores de prevalência de lesões por *overuse* entre esportes individuais e coletivos.

Considerando o impacto das lesões por *overuse* no ambiente esportivo, revisões anteriores<sup>9,19</sup> apresentaram importantes limitações, como a restrição da linguagem dos estudos incluídos, da faixa etária dos atletas e das articulações analisadas, além da não padronização dos métodos de avaliação de lesões por *overuse*. Além disso, uma meta-análise não foi conduzida e uma estimativa precisa da prevalência das lesões por *overuse* em diferentes modalidades esportivas ainda não está clara. Portanto, o objetivo do presente estudo foi revisar sistematicamente a literatura científica sobre a prevalência geral de lesões por *overuse* e reportar a prevalência de lesões em esportes individuais e coletivos, separadamente. Nesse sentido, os resultados desta revisão sistemática podem ajudar na compreensão da relação entre a prática de esportes individuais e coletivos e a prevalência de lesões por *overuse*.



## 2 MÉTODOS

O protocolo de revisão foi registrado prospectivamente no PROSPERO (CRD42019135665) e os métodos seguiram as recomendações do Manual de Revisores do Joanna Briggs Institute (Revisão sistemática dos dados de prevalência e incidência)<sup>20</sup>, as diretrizes da Cochrane Collaboration<sup>21</sup> e PRISMA<sup>22</sup>.

### 2.1 Critérios de inclusão

Considerou-se para inclusão todos os estudos que relataram a prevalência das lesões por *overuse* em diferentes modalidades esportivas, exceto os trabalhos de conferência, resumos, comentários, artigos baseados em opinião, séries de casos e estudos de caso. Além disso, o estudo deveria afirmar que a amostra era composta por atletas de qualquer esporte, independentemente do nível profissional ou amador e da faixa etária.

### 2.2 Estratégia de busca

As pesquisas eletrônicas em bancos de dados foram realizadas desde o registro mais antigo até julho de 2020 usando o MEDLINE e EMBASE (via OvidSP), SPORTDiscus e CINAHL (via EBSCO), sem restrição de idioma ou data. Especificamente no MEDLINE, foi realizada a seguinte estratégia de busca: (prevalence OR incidence OR epidemiology OR probability) AND (athlete OR Sports OR Athletic Injuries OR Sportsperson OR Sports Medicine OR Sportsman OR Sportswoman) AND (overuse OR overuse adj injur OR sport adj injur). Pesquisas manuais adicionais foram realizadas através da revisão de artigos publicados em revistas esportivas relevantes e da lista de referência de todos os estudos elegíveis. Os termos em inglês utilizados na estratégia de busca foram relacionados a 'prevalência', 'lesão por uso excessivo', 'atletas', 'esportes'. A estratégia de busca completa pode ser vista no Apêndice B.

### 2.3 Seleção dos estudos

Após remover as duplicatas, dois revisores independentes (MFF e TMN) examinaram todos os títulos e resumos identificados pela estratégia de busca para elegibilidade. Em seguida, foram recuperados textos completos para todos os estudos elegíveis em potencial. Os

mesmos dois revisores avaliaram independentemente todos os textos completos e foram incluídos estudos que preenchiam os critérios de inclusão. Quaisquer divergências foram resolvidas por um terceiro revisor (FOM).

## 2.4 Extração de dados

Dois revisores (MFF e TMN) extraíram independentemente as características de todos os estudos incluídos (por exemplo, desenho, configuração, população do estudo, definição de lesões por *overuse*, como as lesões por *overuse* foram medidas e sua prevalência), com um terceiro revisor (FOM) para resolver quaisquer discrepâncias. Para dados de prevalência, extraímos a proporção total de lesão por *overuse* e, quando disponível, a proporção de lesão por *overuse* para esportes individuais e em equipe, para cada área anatômica e para cada sexo. Além disso, quando disponível, relatamos prevalência de lesões substanciais por *overuse*, que são definidas como lesões que levam a uma redução moderada ou grave no volume ou no desempenho do treinamento ou na completa incapacidade de participar de esportes.

## 2.5 Avaliação do risco de viés

Dois revisores independentes (MFF e TMN) avaliaram o risco de viés para cada estudo incluído, usando a *The Joanna Briggs Institute Prevalence Critical Appraisal Tool*<sup>23</sup>. Essa ferramenta consiste em 9 itens projetados especificamente para avaliar a qualidade metodológica dos estudos de prevalência. Cada item é classificado como 'sim', 'não' ou 'não claro' de acordo com as informações disponíveis em cada estudo, com uma pontuação máxima de 9 pontos considerando a quantidade de "sim". Quanto maior a pontuação, melhor a classificação. Um terceiro revisor (FOM) resolveu possíveis discordâncias. Para avaliar se o tamanho da amostra de cada estudo incluído era adequado (por exemplo, item 3), usamos a equação fornecida em um estudo anterior<sup>24</sup>, onde  $p$  era a prevalência esperada (29,3%), definida com base nos resultados de um estudo anterior<sup>25</sup>,  $Z$  foi o nível de confiança (1,96) e  $d$  foi a precisão (5,0%).

$$\text{Tamanho da amostra} = \frac{Z_{1-\alpha/2}^2 p(1-p)}{d^2}$$

$d^2$

A estimativa do tamanho da amostra resultou em um tamanho de amostra apropriado de 318 participantes. Um terceiro revisor (RAR) resolveu possíveis divergências quanto à avaliação de risco de viés.

## **2.6 Análise de dados e avaliação da qualidade dos dados**

A estatística  $I^2$  foi usada para avaliar a heterogeneidade entre os estudos e a prevalência estimada de lesões por *overuse* em atletas de diferentes esportes, separando-se em esportes individuais e de equipe, seguindo as recomendações de Cochrane<sup>21</sup>. Para o agrupamento, foi utilizado o modelo de efeitos aleatórios quando  $I^2 \times 50,0\%$ . Todas as análises foram realizadas usando o software Comprehensive Meta-Analysis, V.2.2.04 (Biostat, Englewood, Nova Jersey, EUA). Além disso, dois revisores independentes (MFF e TMN) avaliaram a qualidade geral das evidências usando o Grading of Recommendations Assessment, Development and Evaluation (GRADE)<sup>26</sup>. Essa ferramenta fornece quatro níveis, que variam de evidências de alta qualidade a evidências de muito baixa qualidade. Na revisão atual, as evidências foram rebaixadas em um nível se um dos seguintes critérios pré-especificados estivesse presente: (1) baixa qualidade metodológica (risco médio de viés  $\leq 5$  pontos em 9); (2) imprecisão (quando  $\times 50\%$  dos estudos não apresentaram tamanho amostral apropriado - mínimo de 318 participantes); (3) indireto (quando mais de 25% dos estudos utilizaram medidas não padronizadas de lesões por *overuse*); e (4) inconsistência (se  $I^2 \times 50,0\%$ ). Discrepâncias entre revisores foram resolvidas por um terceiro revisor (FOM).

### **3 RESULTADOS**

#### 3.1 Artigo desenvolvido

1 **TITLE:** Prevalence of overuse injuries in athletes from different sports: A systematic review with  
2 meta-analysis and GRADE recommendations

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20 **Conflict of interest statement:**

21 There are no known conflicts of interest associated with this publication and there has  
22 been no financial support for this work that could have influenced its outcome.

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27 **Abstract**

28 **Objective:** To investigate the overall prevalence of overuse injuries. In addition, we also reported the  
29 prevalence of overuse injuries for individual and team sports.

30 **Design:** Systematic review

31 **Methods:** Searches on MEDLINE, EMBASE, SPORTDiscus and CINAHL from the first registration  
32 to March 2020 and hand-searching identified studies investigating the prevalence of overuse injuries  
33 in athletes from different sports. Meta-analysis was conducted and the GRADE system summarized  
34 overall quality of evidence. This review was registered in PROSPERO (CRD42019135665).

35 **Results:** Twenty studies were included and pooling of 3988 participants (1818 of individual sports  
36 and 2167 of team sports) estimated the overall prevalence of 46.0% (CI 95% 37.0 to 54.0). Moreover,  
37 the prevalence of overuse injuries in athletes of individual and team sports were 60.0% (CI 95% 57.0  
38 to 62.0) and 37.0% (CI 95% 26.0 to 50.0), respectively. Overall quality of evidence was rated as low-  
39 quality.

40 **Conclusion:** Overall prevalence of overuse injuries in sports is extremely high. In addition, individual  
41 sports showed higher prevalence of overuse injuries than team sports. Athletes, clinicians, sport  
42 teams, and policymakers should be aware of the high prevalence of overuse injuries in athletes, but  
43 especially in athletes from individual sports. Current low-quality evidence shows that future high-  
44 quality studies are likely to impact on the estimated prevalence.

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46 **Keywords:** epidemiology; cumulative trauma disorder; athletic injuries; data pooling.

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**Practical implications**

- This review provides overall prevalence of overuse injuries in athletes and in individual and team sports, separately. Current low-quality evidence suggests that the prevalence is likely to change with future high-quality studies.
- The overall prevalence of overuse injuries in sports was 46.0%. This high prevalence could related to the fact that most athletes do not have proper recovery time between different training sessions and competitions.
- The prevalence of overuse injuries in individual sports was higher (60.0%) than in team sports (37.0%), which suggests that overuse injuries is more prevalent in individual sports.
- Athletes, clinicians, sports teams and policy makers should be aware of the high prevalence levels of overuse injuries in athletes, since they might compromise performance and volume of training and, eventually, cause time-loss.

76 **1. Introduction**

77 Sports injuries may have different definitions.<sup>1-3</sup> However, a commonly accepted definition is  
78 any physical complaint sustained by a player that result from a match or training, irrespective of the  
79 need for medical attention or time loss from activities.<sup>2,3</sup> Overuse injury is a type of injury that can  
80 be defined as an injury without a specific and identifiable event associated with its onset.<sup>2</sup> Overuse  
81 injuries result from the cumulative process of tissue damage rather than instantaneous energy  
82 transfer,<sup>4,5</sup> which causes a repetitive microtrauma and overload in the musculoskeletal system that  
83 would not result in injury if the affected tissue had sufficient time to recover.<sup>6,7</sup> Thus, overuse injuries  
84 can cause long-term negative consequences that decrease athlete's performance,<sup>8,9</sup> causing pain and  
85 dysfunction, and in some cases, could end an athlete's career. Therefore, considering that athletes  
86 often do not have proper time to recover between training sessions and competitions, overuse injuries  
87 might be highly prevalent in sports.

88 Prevalence of overuse injuries might be different in individual and team sports. For example,  
89 Lemoyne et al.<sup>10</sup> showed higher prevalence of overuse injuries in individual (24%) sport modalities in  
90 comparison to team sport modalities (8%). This may be explained by the fact that, in individual  
91 sports, all demand is concentrated in an individual athlete, while in team sports demand is shared  
92 between different athletes. In addition, the prevalence of overuse injuries is probably related to the  
93 sports demand. In this context, Aasheim et al.<sup>11</sup> reported prevalence of 39% of overuse injuries in  
94 handball players, with the shoulder (17%), knee (14%), and lumbar joint (12%) as the most frequently  
95 affected joints. In sports where the shoulder is exposed to repeated overhead motion at high speeds,  
96 like handball, overuse injuries are commonly reported.<sup>12,13</sup> Therefore, better understanding about the  
97 prevalence of overuse injuries in individual and team sports may help to design more effective  
98 strategies to prevent overuse injuries in different types of sports.

99 Previous reviews<sup>14,15</sup> that investigated the prevalence of overuse injuries in different sports  
100 had some limitations, such as restricted language of included studies,<sup>14</sup> limited athlete's age range<sup>14,15</sup>  
101 and only reporting injuries to some specific joints.<sup>14,15</sup> Therefore, the purpose of this systematic



102 review with meta-analysis was to measure the overall prevalence of overuse injuries in athletes. In  
103 addition, we also reported the prevalence of overuse injuries in individual and team sports. The results  
104 of this systematic review may help to improve understanding about the relationship between  
105 individual and team sports practice and overuse injury prevalence.

## 106 **2. Materials and Methods**

107 The review protocol was prospectively registered at PROSPERO (CRD42019135665) and the  
108 methods followed recommendations from the Joanna Briggs Institute Reviewers Manual (Systematic  
109 Review of Prevalence and Incidence Data),<sup>16</sup> the Cochrane Collaboration<sup>17</sup> and PRISMA reporting  
110 guidelines.<sup>18</sup>

### 111 **2.1 Inclusion criteria**

112 Inclusion criteria of the studies included in this review were as follows: (1) studies should  
113 specifically report the prevalence of overuse injuries and; (2) the population included should be an  
114 athlete of any sport, regardless of professional or amateur level and age group.

### 115 **2.2 Search**

116 Electronic database searches were performed from the earliest record to July 2020 using  
117 MEDLINE and EMBASE (via OvidSP), SPORTDiscus and CINAHL (via EBSCO), without  
118 language or date restriction. Additional hand searching was conducted by reviewing articles published  
119 in relevant sports journals and the reference list of all eligible studies. The terms used in the search  
120 strategy were related to 'prevalence', 'overuse injury', 'athletes', 'sports'. The complete search strategy  
121 can be seen in online Supplementary Material 1.

### 122 **2.3 Study selection and appraisal**

123 For studies selection, after removing duplicates, two independent reviewers (MFF and TMN)  
124 screened all titles and abstracts identified by the search strategy for eligibility. Then, full texts for all

125 potential eligible studies were retrieved. The same two reviewers independently evaluated all full  
126 texts, and studies fulfilling the inclusion criteria were included. Any disagreements were resolved by a  
127 third reviewer (FOM).

## 128 **2.4 Data extraction**

129 For data extraction, two reviewers (MFF and TMN) independently extracted the  
130 characteristics of all included studies (e.g. study design, setting, study population, overuse injuries  
131 definition, how overuse injuries were measured and their prevalence), with a third reviewer (FOM)  
132 resolving any discrepancies. For prevalence data, we extracted the total proportion of overuse injury  
133 and, when available, the proportion of overuse injury for individual and team sports, for each  
134 anatomical area, and for each sex. Moreover, when available, we reported prevalence of substantial  
135 overuse injuries, which is defined as injuries leading to moderate or severe reduction in training  
136 volume or performance, or complete inability to participate in sports.

## 137 **2.5 Bias risk assessment**

138 Two independent reviewers (MFF and TMN) assessed risk of bias for each included study,  
139 using the Joanna Briggs Institute Prevalence Critical Appraisal Tool.<sup>19</sup> This tool consists of 9 items  
140 specifically design to assess the methodological quality of prevalence studies. Each item is rated as  
141 'yes', 'no' or 'unclear' according to information available in each study, with a maximum score of 9  
142 points considering the amount of "yes". The higher the score, the better the classification. A third  
143 reviewer (FOM) solved potential disagreements. To assess if sample size of each included study was  
144 appropriate (e.g. item 3), we used the equation provided in a previous study,<sup>20</sup> where  $p$  was the  
145 expected prevalence (29.3%), which was defined based on the results of a previous study,<sup>21</sup>  $Z$  was the  
146 confidence level (1.96), and  $d$  was the precision (5.0%). Sample size estimation resulted in an  
147 appropriate sample size of 318 participants. A third reviewer (RAR) solved potential disagreements  
148 regarding risk of bias assessment.

149

150 **2.6 Data analysis and data quality assessment**

151 The  $I^2$  statistics was used to assess among-study heterogeneity and pooling estimated  
152 prevalence of overuse injuries in athletes of different sports, separating in individual and team sports,  
153 following the Cochrane recommendations.<sup>17</sup> For pooling, random-effects model was used when  $I^2 \times$   
154 50.0%. All analyses were conducted using Comprehensive Meta-Analysis software, V.2.2.04  
155 (Biostat, Englewood, New Jersey, USA). Moreover, two independent reviewers (MFF and TMN)  
156 assessed the overall quality of evidence using the Grading of Recommendations Assessment,  
157 Development and Evaluation (GRADE) system.<sup>22</sup> This tool provides four levels ranging from high-  
158 quality evidence to very low-quality evidence. In the current review, the evidence was downgraded by  
159 one level if one of the following pre-specified criteria was present: (1) poor methodological quality  
160 (average risk of bias  $\leq 5$  points out of 9); (2) imprecision (when  $\times 50\%$  of studies did not present  
161 appropriate sample size  $\geq$  minimum of 318 participants); (3) indirectness (when more than 25% of  
162 studies used non-standard measurements of overuse injuries); and (4) inconsistency (if  $I^2 \times 50.0\%$ ).  
163 Between-reviewer discrepancies were resolved by a third reviewer (FOM).

164 **3. Results**

165 **3.1 Study selection**

166 Searches retrieved 3929 titles and, after excluding duplicates, we identified 1526 references  
167 that had the title analyzed. Following the title, abstracts, and full-texts screening, 20 studies were  
168 included in this review. Included studies were published between the years of 2007 and 2020. The  
169 main reasons for excluding potential full texts ( $n = 54$ ) were non-athlete participants ( $n = 3$ ) and not  
170 reporting the prevalence of overuse injuries ( $n = 51$ ) (Figure 1).

171 `Insert_Figure_1_near_here`

172 Most of the included studies ( $n = 12$ ) included data from both sex,<sup>10,23-33</sup> six included only  
173 male athletes,<sup>11,34-38</sup> one included only females participants,<sup>39</sup> and one did not specify the participants' sex.<sup>40</sup> Regarding the study design, fourteen were prospective cohort studies,<sup>11,23-26,28,31,3-39</sup> one study  
174 was retrospective cohort study,<sup>30</sup> three studies were descriptive epidemiological studies,<sup>29,32,40</sup> and two

176 were cross-sectional studies.<sup>10,27</sup> For overuse injuries measurement, nine studies used Oslo Sports  
177 Trauma Research Center questionnaire (OSTRC),<sup>11,23,24,28,31,32,34,38,39</sup> two used the Oslo Sports Trauma  
178 Research Center questionnaire on health problems (OSTRC-H),<sup>26,28</sup> two used an injury record  
179 form,<sup>25,29</sup> five used a questionnaire on injuries originally developed by the authors,<sup>10,27,30,36,40</sup> one used  
180 medical record data<sup>37</sup> and one used physical examination by an orthopedic surgeon.<sup>33</sup> Twelve studies  
181 reported prevalence of overuse injuries separated by anatomical areas,<sup>11,23-28,31,34,38-40</sup> one study  
182 reported separated team and individual sports,<sup>10</sup> and ten studies reported the prevalence of substantial  
183 overuse injuries<sup>11,23,24,28,31,32,35,38,39</sup>

184 Insert\_Table\_1\_near\_here

### 185 3.2 Methodological quality

186 Mean (standard deviation) methodological quality of the included studies was 6.05 (1.86) out  
187 of 9 (ranging from 0 to 9). Only four studies scored 5 out of 9.<sup>29,33,35,36</sup> Methodological quality items  
188 for each included study are reported in Table 1. Out of twenty studies, eight did not use sample frame  
189 appropriate to address the target population,<sup>11,29-31,34-37</sup> six did not sample study participants in an  
190 appropriate way,<sup>11,23,33-36</sup> seventeen did not have appropriate sample size,<sup>10,11,23-27,29,31-33,35-40</sup> eight did  
191 not describe subjects and the setting in detail,<sup>26,29,31,34-38</sup> one did not analyze data with sufficient  
192 coverage of the identified sample,<sup>36</sup> seven did not use valid methods for the identification of overuse  
193 injuries,<sup>10,25,27,33,36,37,40</sup> three did not present measures in a standard and reliable way for all  
194 participants,<sup>29,33,36</sup> three did not have appropriate statistical analysis,<sup>33,35,36</sup> and six did not reach  
195 appropriate response rate.<sup>10,26,27,29,30,36</sup>

196 Insert\_Table\_2\_near\_here

### 197 3.3 Review characteristics

198 Pooling of 3988 participants, 1821 of individual sports and 2167 of team sports, from the 20  
199 included studies estimated the overall prevalence of overuse injuries in sports and the prevalence of  
200 this type of injury in individual and team sports, separately (Figure 2). According to the GRADE  
201 system, pooling of twenty studies provided low-quality evidence that the overall prevalence of  
202 overuse injuries in sports was 46.0% (95% Confidence interval [CI]: 37.0 to 54.0, I<sup>2</sup> = 12.7%). In

203 addition, the prevalence of overuse injuries in individual sports was 60.0% (95% CI: 57.0 to 62.0,  $I^2$   
204 = 50.1%) and in team sports was 37.0% (95% CI: 26.0 to 50.0%,  $I^2$  = 29.6%) and. Overall quality of  
205 evidence for individual and team sports meta-analyses was rated as low quality (downgraded due to  
206 imprecision and indirectness).

207 Insert\_Figure\_2\_near\_here

#### 208 **4. Discussion**

209 This is the first systematic review with meta-analysis that investigated the overall prevalence  
210 of overuse injuries in athletes and in individual and team sports, separately. The overall prevalence of  
211 overuse injuries in sports was 46.0% (95% CI: 37.0 to 54.0). In addition, prevalence of overuse  
212 injuries was 60.0% (95% CI: 57.0 to 62.0) in individual sports and 37.0% (95% CI: 26.0 to 50.0) in  
213 team sports. These results demonstrate that overuse injuries are highly prevalent in athletes and  
214 suggest that athletes from individual sports have higher prevalence of overuse injuries than athletes  
215 from team sports. According to the GRADE system, we found low-quality evidence, which suggests  
216 that estimated prevalence of overuse injuries in athletes will probably change with future high-quality  
217 studies.

218 The meta-analysis demonstrated that the overall prevalence of overuse injuries in athletes was  
219 high (46.0%). This might be explained by the fact that most athletes do not have proper recovery time  
220 between different training sessions and competitions.<sup>5</sup> Previous reviews about the prevalence of  
221 overuse injuries in upper limbs of youth athletes also demonstrated high prevalence rates, varying  
222 from 32% to 75% between different sport modalities and different upper limb joints.<sup>14,41</sup> A recent  
223 systematic review demonstrated that the prevalence of acute injuries in athletes is 66.2%.<sup>42</sup> Therefore,  
224 the present findings suggest that overuse injuries is more prevalent than acute injuries in athletes.  
225 Although some overuse injuries might not cause time loss from sport or draw athletes to seek medical  
226 attention, they can significantly reduce performance and volume of training<sup>2</sup> and, in the long-term,  
227 cause time-loss.

228 The prevalence of overuse injuries was 60.0% in individual sports and 37.0% in team sports.  
229 Previous studies demonstrated prevalence rates of overuse injuries varying from 56 to 82% in

230 individual sports,<sup>23,29</sup> and between 12.8 and 63.0% in team sports.<sup>28,38</sup> These findings suggest that  
231 overuse injuries are more prevalent in individual sports (e.g. tennis, athletics, and swimming) than in  
232 team sports (e.g. handball, volleyball and basketball). This might be explained by the fact that athletes  
233 from individual sports are more frequently submitted to highly repetitive training regime,<sup>43</sup> which can  
234 result in cumulative tissue damage without time to recover and, consequently, on overuse injuries. For  
235 example, tennis matches can often last several hours, which put the athlete under repetitive stress for  
236 long periods and through a variety of strokes and movements.<sup>44-46</sup> Pluim et al.<sup>47</sup> demonstrated that  
237 tennis players averaged 9.1 hours of training practice and 2.2 hours of matches, which might help to  
238 explain why overuse injuries had the highest prevalence (47.0%) in comparison to acute injuries  
239 (13.0%) and illness (36%) in the same study. In addition, athletes from individual sports often begin  
240 sport practice earlier in life and have higher weekly training volume than athletes from team sports.<sup>48</sup>  
241 Thus, the type and specific demand of each sport modality may help to explain the different  
242 prevalence levels of overuse injuries between individual and team sports.

243 Previous systematic reviews investigating prevalence of overuse injuries in athletes had  
244 methodological limitations, such as restricted language of publications,<sup>14,41,49</sup> pre-specified age,<sup>14</sup>  
245 analysis of specific joints,<sup>14,50,51</sup> inclusion of only some specific types of sports<sup>41,49</sup> and paralympic  
246 athletes,<sup>51</sup> lack of protocol registration<sup>14,49,51</sup> and non-assessment of the strength of evidence.<sup>41</sup>  
247 Moreover, no meta-analysis was performed with the purpose of estimating the prevalence of overuse  
248 injuries in individual and team sports, separately. The current systematic review with meta-analysis  
249 had its protocol prospectively registered in PROSPERO and the strength of the evidence evaluated  
250 using the GRADE system. The prevalence of overuse injuries in individual and team sports found in  
251 the present study differs from the prevalence reported in previous reviews,<sup>14,41</sup> partially due to the  
252 different purposes of each review. For example, Kox et al.<sup>14</sup> reviewed the studies about the prevalence  
253 of overuse injuries on the wrist of young athletes from different sports (e.g. gymnastics, field hockey,  
254 judo), and found prevalence rates varying from 10 to 28% in the different sports. On the other hand,  
255 Smith et al.<sup>41</sup> reviewed studies reporting the prevalence of musculoskeletal injuries in amateur ballet  
256 dancers and found prevalence of 75% of overuse injuries. In addition, differences in overuse injury

257 definition, inclusion criteria and in procedures used to extract data might also explain the different  
258 number of studies included in each review. Therefore, considering the different focus and/or  
259 limitations demonstrated by previous systematic reviews on the topic, this review provides additional  
260 and relevant information on the prevalence of overuse injuries in individual and team sports for  
261 athletes, clinicians, sports teams, researchers, and policy makers. This review is not without  
262 limitations. It was not possible to define specific criteria to characterize overuse injuries, since most of  
263 the studies adopted different definitions. In order to solve this limitation, we only included studies that  
264 clearly stated the overuse injury definition. Another limitation is related to the heterogeneity of the  
265 methods used to measure overuse injuries, since some studies used non-standard tools to collect the  
266 prevalence of overuse injuries, which can under- or overestimate the prevalence of this type of injury.  
267 Future studies should use standard definitions of overuse injuries and also adopt standard tools to  
268 measure this type of injury to improve quality and confidence on the prevalence data. Finally, the  
269 findings of this review might not be valid for sports modalities that were not included in the studies  
270 reviewed, such as judo, weightlifting, and rugby. Therefore, future studies about the prevalence of  
271 overuse injuries in different individual and team sports might significantly influence on the estimated  
272 prevalence of overuse injuries.

## 273 **5. Conclusion**

274 This systematic review with meta-analysis showed that overall prevalence of overuse injuries  
275 in athletes was 46.0% (CI 95% 37.0 to 54.0). In addition, prevalence of overuse injuries was 60.0%  
276 (CI 95% 57.0 to 62.0) in individual sports and 37.0% (CI 95% 26.0 to 50.0) in team sports. Current  
277 low-quality evidence suggests that the prevalence is likely to change with future high-quality studies.  
278 The high prevalence of overuse injuries challenges athletes, health professionals, sports teams,  
279 researchers and policy makers to seek better understanding about the mechanisms related to overuse  
280 injuries occurrence and hopefully to design, test and implement strategies to prevent the occurrence of  
281 this type of injury.

282

283

284 **References**

- 285 1. van Mechelen W, Hlobil H, Kemper HC. Incidence, severity, aetiology and prevention of sports  
286 injuries. A review of concepts. *Sports Med.* 1992;14:82-99.
- 287 2. Clarsen B, Myklebust G, Bahr R. Development and validation of a new method for the registration  
288 of overuse injuries in sports injury epidemiology: the Oslo Sports Trauma Research Centre (OSTRC)  
289 overuse injury questionnaire. *Br J Sports Med.* 2013;47:495-502.
- 290 3. Fuller CW, Ekstrand J, Junge A, et al. Consensus statement on injury definitions and data collection  
291 procedures in studies of football (soccer) injuries. *Clin J Sport Med.* 2006;16:97-106.
- 292 4. Finch CF. An overview of some definitional issues for sports injury surveillance. *Sports Med.*  
293 1997;24:157-63.
- 294 5. Cook J, Finch C. The long-term impact of overuse injuries on life-long participation in sport and  
295 health status. In: Farelli D, editor. *Sport Participation: Health Benefits, Injuries and Psychological*  
296 *Effects.* Hauppauge, NY: Nova Science Publishers; 2011;85-104.
- 297 6. Roos KG, Marshall SW, Kerr ZY, et al. Epidemiology of Overuse Injuries in Collegiate and High  
298 School Athletics in the United States. *Am J Sports Med.* 2015;43:1790-7.
- 299 7. Bonza JE, Fields SK, Yard EE, et al. Shoulder injuries among United States high school athletes  
300 during the 2005-2006 and 2006-2007 school years. *J Athl Train.* 2009;44:76-83.
- 301 8. von Rosen P, Heijne A, Frohm A, et al. High Injury Burden in Elite Adolescent Athletes: A 52-  
302 Week Prospective Study. *J Athl Train.* 2018;53:262-70.
- 303 9. von Rosen P, Heijne A. Substantial injuries influence ranking position in young elite athletes of  
304 athletics, cross-country skiing and orienteering. *Scand J Med Sci Sports.* 2018;28:1435-42.
- 305 10. Lemoyne J, Poulin C, Richer N, et al. Analyzing injuries among university-level athletes:  
306 prevalence, patterns and risk factors. *J Can Chiropr Assoc.* 2017;61:88-95.
- 307 11. Aasheim C, Stavenes H, Andersson SH, et al. Prevalence and burden of overuse injuries in elite  
308 junior handball. *BMJ Open Sport Exerc Med.* 2018;4:e000391.



- 309 12. Andersson SH, Bahr R, Clarsen B, et al. Preventing overuse shoulder injuries among throwing  
310 athletes: a cluster-randomised controlled trial in 660 elite handball players. *Br J Sports Med.*  
311 2017;51:1073-80.
- 312 13. Wilk KE, Obma P, Simpson CD, et al. Shoulder injuries in the overhead athlete. *J Orthop Sports*  
313 *Phys Ther.* 2009;39:38-54.
- 314 14. Kox LS, Kuijjer PP, Kerkhoffs GM, et al. Prevalence, incidence and risk factors for overuse  
315 injuries of the wrist in young athletes: a systematic review. *Br J Sports Med.* 2015;49:1189-96.
- 316 15. Kraan RBJ, de Nobel D, Eygendaal D, et al. Incidence, prevalence, and risk factors for elbow and  
317 shoulder overuse injuries in youth athletes: A systematic review. *Transl Sports Med.* 2019;2:186-95.
- 318 16. Munn Z, Moola S, Lisy K, Riitano D. The Joanna Briggs Institute. The Joanna Briggs Institute  
319 Reviewers Manual 2014. The Systematic Review of Prevalence and Incidence Data. 2014. Available  
320 at: <https://nursing.lsuhscc.edu/JBI/docs/ReviewersManuals/Economic.pdf>. Accessed July 1, 2020.
- 321 17. Higgins JP, Green S, eds. Cochrane Handbook for Systematic Reviews of Interventions Version  
322 5.1.0. The Cochrane Collaboration. Available at: <https://handbook-5-1.cochrane.org/>. Accessed July  
323 1, 2020.
- 324 18. Moher D, Stewart L, Shekelle P. Implementing PRISMA-P: recommendations for prospective  
325 authors. *Syst Rev.* 2016;5:15.
- 326 19. Munn Z, Moola S, Lisy K, et al. Methodological guidance for systematic reviews of observational  
327 epidemiological studies reporting prevalence and cumulative incidence data. *Int J Evid Based*  
328 *Healthc.* 2015;13:147-53.
- 329 20. Charan J, Biswas T. How to calculate sample size for different study designs in medical research?  
330 *Indian J Psychol Med.* 2013;35:121-6.
- 331 21. Yang J, Tibbetts AS, Covassin T, et al. Epidemiology of overuse and acute injuries among  
332 competitive collegiate athletes. *J Athl Train.* 2012;47:198-204.
- 333 22. Guyatt G, Oxman AD, Akl EA, et al. GRADE guidelines: 1. Introduction-GRADE evidence  
334 profiles and summary of findings tables. *J Clin Epidemiol.* 2011;64:383-94.

- 335 23. Andersen CA, Clarsen B, Johansen TV, et al. High prevalence of overuse injury among iron-  
336 distance triathletes. *Br J Sports Med*. 2013;47:857-61.
- 337 24. Clarsen B, Bahr R, Heymans MW, et al. The prevalence and impact of overuse injuries in five  
338 Norwegian sports: Application of a new surveillance method. *Scand J Med Sci Sports*. 2015;25:323-  
339 30.
- 340 25. Cumps E, Verhagen E, Meeusen R. Prospective epidemiological study of basketball injuries  
341 during one competitive season: Ankle sprains and overuse knee injuries. *J Sports Sci Med*.  
342 2007;6:204-211.
- 343 26. Delfino Barboza S, Nauta J, van der Pols MJ, et al. Injuries in Dutch elite field hockey players: A  
344 prospective cohort study. *Scand J Med Sci Sports*. 2018;28:1708-14.
- 345 27. Koh JO. Prevalence rate of chronic overuse pain in taekwondo athletes. *J Sports Med Phys*  
346 *Fitness*. 2017;57:1330-7.
- 347 28. Leppanen M, Pasanen K, Clarsen B, et al. Overuse injuries are prevalent in children's competitive  
348 football: a prospective study using the OSTRC Overuse Injury Questionnaire. *Br J Sports Med*.  
349 2019;53:165-71.
- 350 29. Magno ESMP, Winckler C, Costa ESAA, et al. Sports injuries in paralympic track and field  
351 athletes with visual impairment. *Med Sci Sports Exerc*. 2013;45:908-13.
- 352 30. Tenforde AS, Sayres LC, McCurdy ML, et al. Overuse injuries in high school runners: lifetime  
353 prevalence and prevention strategies. *PM R*. 2011;3:125-31.
- 354 31. von Rosen P, Heijne AI, Frohm A. Injuries and Associated Risk Factors Among Adolescent Elite  
355 Orienteerers: A 26-Week Prospective Registration Study. *J Athl Train*. 2016;51:321-8.
- 356 32. Worner T, Clarsen B, Thorborg K, et al. Elite Ice Hockey Goalkeepers Have a High Prevalence of  
357 Hip and Groin Problems Associated With Decreased Sporting Function: A Single-Season Prospective  
358 Cohort Study. *Orthopaedic Journal of Sports Medicine*. 2019;7:2325967119892586.
- 359 33. Matsuura Y, Hangai M, Koizumi K, et al. Injuries and physical characteristics affecting swimmer  
360 participation in the Olympics: A prospective survey. *Physical Therapy in Sport*. 2020;44:128-135.

361 34. Docking SI, Rio E, Cook J, et al. The prevalence of Achilles and patellar tendon injuries in  
362 Australian football players beyond a time-loss definition. *Scand J Med Sci Sports*. 2018;28:2016-22.

363 35. Nordstrom A, Bahr R, Talsnes O, et al. Prevalence and Burden of Health Problems in Male Elite  
364 Ice Hockey Players: A Prospective Study in the Norwegian Professional League. *Orthop J Sports*  
365 *Med*. 2020;8:2325967120902407.

366 36. Pastor MF, Ezechieli M, Classen L, et al. Prospective study of injury in volleyball players: 6 year  
367 results. *Technol Health Care*. 2015;23:637-43.

368 37. Rejeb A, Johnson A, Vaeyens R, et al. Compelling overuse injury incidence in youth multisport  
369 athletes. *Eur J Sport Sci*. 2017;17:495-502.

370 38. Weiss KJ, McGuigan MR, Besier TF, et al. Application of a Simple Surveillance Method for  
371 Detecting the Prevalence and Impact of Overuse Injuries in Professional Men's Basketball. *J Strength*  
372 *Cond Res*. 2017;31:2734-9.

373 39. Nagano Y, Kobayashi-Yamakawa K, Higashihara A, et al. Japanese translation and modification  
374 of the Oslo Sports Trauma Research Centre overuse injury questionnaire to evaluate overuse injuries  
375 in female college swimmers. *PLoS One*. 2019;14:e0215352.

376 40. Clarsen B, Krosshaug T, Bahr R. Overuse injuries in professional road cyclists. *Am J Sports Med*.  
377 2010;38:2494-501.

378 41. Smith PJ, Gerrie BJ, Varner KE, et al. Incidence and Prevalence of Musculoskeletal Injury in  
379 Ballet: A Systematic Review. *Orthop J Sports Med*. 2015;3:1-9.

380 42. Hinds N, Angioi M, Birn-Jeffery A, et al. A systematic review of shoulder injury prevalence,  
381 proportion, rate, type, onset, severity, mechanism and risk factors in female artistic gymnasts. *Phys*  
382 *Ther Sport*. 2019;35:106-15.

383 43. Renstrom P, Johnson RJ. Overuse injuries in sports. A review. *Sports Med*. 1985;2:316-33.

384 44. Kovacs MS. Applied physiology of tennis performance. *Br J Sports Med*. 2006;40:381-5.

385 45. Elliott B. Biomechanics and tennis. *Br J Sports Med*. 2006;40:392-6.

386 46. Perkins RH, Davis D. Musculoskeletal injuries in tennis. *Phys Med Rehabil Clin N Am*.  
387 2006;17:609-31.

- 388 47. Pluim BM, Loeffen FG, Clarsen B, et al. A one-season prospective study of injuries and illness in  
389 elite junior tennis. *Scand J Med Sci Sports*. 2016;26:564-71.
- 390 48. Pasulka J, Jayanthi N, McCann A, et al. Specialization patterns across various youth sports and  
391 relationship to injury risk. *Phys Sportsmed*. 2017;45:344-52.
- 392 49. Hincapie CA, Morton EJ, Cassidy JD. Musculoskeletal injuries and pain in dancers: a systematic  
393 review. *Arch Phys Med Rehabil*. 2008;89:1819-29.
- 394 50. Sobhani S, Dekker R, Postema K, et al. Epidemiology of ankle and foot overuse injuries in sports:  
395 A systematic review. *Scand J Med Sci Sports*. 2013;23:669-86.
- 396 51. Heyward OW, Vegter RJK, de Groot S, et al. Shoulder complaints in wheelchair athletes: A  
397 systematic review. *PLoS One*. 2017;12:e0188410

Table 1. Characteristics of the included studies (n = 20)

Study, year	Design	Setting	Study Population	Overuse injuries definition	Overuse injuries measurement	Prevalence of overuse injuries
Aasheim et al., <sup>11</sup> 2018	Prospective cohort study	Location: Norway Sample selection: Expedience	n* = 145 Range age: 16.0-18.0 years (SD N/A) Gender: Male Sport: Handball Practice duration: 14 hours per week	Type of injuries that are caused by cumulative tissue overload without any clear onset	The Oslo Sports Trauma Research Center (OSTRC) Overuse Injury Questionnaire	All overuse injuries*: (57)** 39.0% Shoulder: (25)** 17.0%, Knee: (20)** 14.0%, Lower back (17)**: 12.0%, Elbow (13)**: 9.0% Substantial overuse problems***: (22)** 15.0% Shoulder (10)**: 7.0%, Knee (7)**: 5.0%, Lower back (4)**: 3.0%, Elbow (1)**: 1.0%
Andersen et al., <sup>23</sup> 2013	Prospective cohort study	Location: Norway Sample selection: Expedience	n* = 174 Average age: 38.0 years (SD 9) Gender: Male and female Sport: Triathlon Practice duration: 276 hours in training during the 26 weeks	N/A	The Oslo Sports Trauma Research Center (OSTRC) Overuse Injury Questionnaire	All overuse injuries*: (97)** 56.0% Knee (43)**: 25.0%, Lower leg (40)**: 23.0%, Lower back (40)**: 23.0%, Shoulder (35)**: 20.0%, Thigh (21)**: 12.0% Substantial overuse problems***: (35) 20.0% Knee (12)**: 7.0%, Lower leg (12)**: 7.0%, Shoulder (7)**: 4.0%, Lower back (7)**: 4.0%, Thigh (5)**: 3.0%
Clarsen et al., <sup>40</sup> 2010	Descriptive epidemiology study	Location: Norway Sample selection: Expedience	n* = 109 Average age: 26.0 years (SD 4) Gender: N/A Sport: Road cycling	Any pain or discomfort that was not directly associated with a traumatic event and was different from the	Interview on overuse injuries	All overuse injuries*: (74)** 68.0% Lower back (49)**: 45.0%, Knee (25)**: 23.0%

**Continued**

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			Practice duration: 904 hours per year	normal aches and pains associated with competitive cycling		
Clarsen et al., <sup>24</sup> 2015	Prospective cohort study	Location: Norway Sample selection: Expedience	n* = 313 (cross-country skiing = 45; road cycling = 98; floorball = 50; handball = 55; volleyball = 65) Range age: 14.0-32.0 years (SD N/A) for boys and 14.0-33.0 (SD N/A) years for girls Practice duration: On average 4 to 25 years (male) and 3 to 18 years (female)	The result of a cumulative process of tissue damage rather than instantaneous energy transfer; The Oslo Sports Trauma Research Center Overuse Injury Questionnaire	The Oslo Sports Trauma Research Center (OSTRC) Overuse Injury Questionnaire	All overuse injuries*: N/A Cross-country skiing*: N/A Knee (25)**: 8.0%, Lower back (16)**: 5.0%, Anterior thigh (37)**: 12.0%, Shoulder (3)**: 1.0% Road cycling*: N/A Knee (72)**: 23.0%, Lower back (50)**: 16.0%, Anterior thigh (25)**: 8.0%, Shoulder (22)**: 7.0% Floorball*: N/A Lower back (91)**: 29.0%, Knee (84)**: 27.0%, Shoulder (47)**: 15.0% Handball*: N/A Shoulder (69)**: 22.0%, Knee (63)**: 20.0%, Lower back (37)**: 12.0% Volleyball*: N/A Knee (112)**: 36.0%, Shoulder (50)**: 16.0%, Lower back (44)**: 14.0% Substantial overuse problems***: N/A Cross-country skiing*: N/A Anterior thigh (22)**: 7.0%, Knee (3)**: 1.0%, Lower back (3)**: 1.0%, Shoulder (3)**: 1.0% Road cycling*: N/A

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						Knee (25)**: 8.0%, Lower back (19)**: 6.0%, Anterior thigh (12)**: 4.0%, Shoulder (3)**: 1.0% Floorball*: N/A Knee (12)**: 4.0%, Lower back (9)**: 3.0%, Shoulder (3)**: 1.0% Handball*: N/A Knee (25)**: 8.0%, Shoulder (19)**: 6.0%, Lower back (6)**: 2.0% Volleyball*: N/A Knee (47)**: 15.0%, Shoulder (16)**: 5.0%, Lower back (3)**: 1.0%
Cumps et al., <sup>25</sup> 2007	Prospective cohort study	Location: Belgium Sample selection: Expedience	n* = 164 Average age: 23.7 years (SD 7) Gender: Male and female Sport: Basketball Practice duration: 16.0 hours for men and 7.0 hours for women throughout the 32 week season	Physical discomfort with an insidious onset, which caused pain and/or stiffness of the musculoskeletal system, and which was present during and / or after the activity	Injury registration form	All overuse injuries*: (63)** 38.5% Knee (64)**: 39.0%, Other lower extremity (43)**: 26.4%, Back (26)**: 16.0%, Other upper extremity (7)**: 4.6%
Delfino Barboza et al., <sup>26</sup> 2018	Prospective cohort study	Location: Netherlands Sample selection: Expedience	n* = 80 Average age: 23.2 years (SD N/A) Gender: Male and female Sport: Field hockey Practice duration: 8.8 hours (median of 10	Overuse injury was considered if onset could not be linked to a clearly identifiable event	Dutch version of the Oslo Sports Trauma Research Centre questionnaire on health problems (OSTRC-H)	All overuse injuries*: (44) 55.0% Thigh (10)**: 13.0%, Knee (8)**: 10.0%, Lower leg (6)**: 8.0%, Lower back (6)**: 7.0%, Hip/groin/pelvis (5)**: 6.0%, Foot/toe (4)**: 5.0%,

Continued

			hours per 2 weeks)			Shoulder/upper arm (4)**: 5.0%, Ankle (2)**: 3.0%, Upper back/thorax/chest (2)**: 2.0%, Finger/wrist/hand (1)**: 1.0%, Head/face/neck (1)**: 1.0%
Docking et al., <sup>34</sup> 2018	Prospective cohort study	Location: Australia Sample selection: Expedience	n* = 441 Average age: 24.8 years (SD N/A) Gender: Male Sport: Football Practice duration: N/A	Gradual development of signs and symptoms resulting in a reduction in training, decrease in performance, and pain, with only the most severe cases resulting in time away from sport	The Oslo Sports Trauma Research Center (OSTRC) Overuse Injury Questionnaire	All overuse injuries*: (174)** 39.4% Knee (111)**: 25.2%, Ankle (95)**: 21.5% Substantial overuse problems***: (62)** 14.2% Knee (35)**: 7.9%, Ankle (28)**: 6.3%
Koh et al., <sup>27</sup> 2017	Cross-sectional study	Location: South Korea Sample selection: Expedience	n* = 263 Average age: 18.3 years (SD 5.5) Gender: Male and female Sport: Taekwondo Practice duration: 4.4 (2.8) years; 5.8 (1.3) days per week	Repetitive micro stresses to bone and musculo-tendinous tissues and when the micro-stress is at a greater rate than its healing process	An injury questionnaire originally developed by the authors	All overuse injuries*: (173)** 65.8% Lower extremity (202)**: 76.8%, Axial body (19)**: 7.4%, Upper extremity (16)**: 6.3%
Lemoyne et al., <sup>10</sup> 2017	Cross-sectional study	Location: Canada Sample selection: Expedience	n* = 82 Average age: 24.0 years (SD 1.9) Gender: Male and female Sport: Cross-country running, cheerleading, ice hockey, soccer, swimming and volleyball	Gradual-onset injuries caused by repeated trauma	Online questionnaire	All overuse injuries*: (11)** 13.0% Individual sports (20)**: 24.0%, Team sports (6)**: 8.0%



**Continued**

			Practice duration: 12.3 (SD 5.4) hours per week			
Leppänen, et al., <sup>28</sup> 2019	Prospective cohort study	Location: Finland Sample selection: Expedience	n* = 733 Average age: 11.7 years (SD 1.1) for boys and 11.8 years (SD 1.1) for girls Gender: Male and female Sport: Football Practice duration: 6.3 (1.7) years for boys and 5.1 (1.7) years for girls	N/A	The Oslo Sports Trauma Research Center (OSTRC) Overuse Injury Questionnaire	All overuse injuries*: (99)** 12.8% Knee (42)**: 5.7%, Heel (19)**: 2.6%, Hip/groin (8)**: 1.1%, Lower back (6)**: 0.8% Substantial overuse problems***: (44) 6.0% Knee (17)**: 2.4%, Heel (8)**: 1.1%, Hip/groin (4)**: 0.5%, Lower back (4)**: 0.5%
Magno e Silva et al., <sup>29</sup> 2013	Descriptive, observational, analytic epidemiological study	Location: Brazil Sample selection: Expedience	n* = 40 Average age: N/A Gender: Male and female Sport: Paralympic Track and Field Practice duration: N/A	Repeated microtrauma without a single, identifiable event responsible for the injury	A standardized injury report form	All overuse injuries*: (33)** 82.0%
Matsuura et al., <sup>33</sup> 2020	Prospective study	Location: Japan Sample selection: Expedience	n* = 64 Average age: 22.0 (SD 3.0) years for boys and 20.0 (SD 4.0) years for girls Gender: Male and female Sport: Swimming Practice duration: 10.5 (SD 0.7) days per week	Any injury by an orthopedic surgeon as having an överuseö basic injury mechanism.	Physical examination by an orthopedic surgeon during the training camp.	All overuse injuries*: N/A Olympian (7)*: N/A Male (5)**: 41.7%, Female (2)**: 15.4% Non-Olympian (18)*: N/A Male (10)**: 41.7%, Female (8)**: 53.3%

**Continued**

Nagano et al., <sup>39</sup> 2019	Prospective study	Location: Japan Sample selection: Expedience	n* = 29 Average age: N/A Gender: Female Sport: Swimming Practice duration: 7.7 years (SD 1.2)	Injuries which are not associated with a specific, clearly identifiable injury event, regardless of whether their onset was gradual or rapid	Japan version of the Oslo Sports Trauma Research Center (OSTRC) Overuse Injury Questionnaire	All overuse injuries*: (14)** 49.1% Lower back (8)**: 27.6%, Shoulder (5)**: 16.0%, Knee (3)**: 9.9%, Ankle (3)**: 9.0%, Hip/thigh (2)**: 5.2%, Pelvis/glute (1)**: 3.1%, Foot (1)**: 2.8%, Elbow/upper arm (0)**: 2.2%, Wrist/forearm (0.4)**: 1.3%, Finger (0)**: 0.3% Substantial overuse problems***: (3)** 10.9% Lower back (1)**: 4.3%, Knee (0)**: 2.8%, Ankle (0)**: 1.2%, Shoulder (0)**: 0.6% Hip/thigh (0)**: 0.4%, Pelvis/glute (0)**: 0.2%, Elbow/upper arm (0)**: 0.2%
Nordstrom et al., <sup>35</sup> 2020	Prospective cohort study	Location: Norway Sample selection: Expedience	n* = 225 Range age: 17.0-41.0 years (SD N/A) Gender: Male Sport: Ice hockey Practice duration: N/A	Overuse injury is a specific unidentifiable event responsible for its occurrence	Oslo Sports Trauma Research Center Questionnaire on Health Problems (OSTRC-H)	All overuse injuries*: (34)** 15.0% Substantial overuse injuries***: (13)** 6.0%
Pastor et al., <sup>36</sup> 2015	Prospective study	Location: Germany Sample selection: Expedience	n* = 34 Average age: 25.4 years (SD N/A) Gender: Male Sport: Volleyball Practice duration: N/A	N/A	A questionnaire originally developed by the authors	All overuse injuries*: (8)** 24.7%
Rejeb et al., <sup>37</sup> 2017	Prospective study	Location: Middle Eastern	Range age: 12.0-18.0 years (SD N/A)	Injuries resulting from insidious onset without	Data from medical	All overuse injuries*: (83)** 50.3%

**Continued**

		Sample selection: Expedience	Gender: Male Sport: Track and field, squash, table tennis, fencing, gymnastics, swimming, golf and shooting Practice duration: 16 hours per week and 120 minutes per session	a recognizable mechanism	records were used to document all sports- related injuries	
Tenforde et al., <sup>30</sup> 2011	Retrospective study	Location: San Francisco Sample selection: Expedience	n* = 748 Average age: 15.4 years (SD 1.2) for boys and 11.8 years (SD 1.1) for girls years Gender: Male and Female Sport: Cross-country and track and field Practice duration: N/A	N/A	Online survey with questions that detailed previous injuries sustained	All overuse injuries*: N/A Girls (301)**: 68.0%, Boys (181)**: 59.0%
Von Rosen et al., <sup>31</sup> 2016	Prospective cohort study	Location: Sweden Sample selection: Expedience	n* = 64 Average age: 17.0 years (SD 1.0) Gender: Male and Female Sport: Running Practice duration: 6.8 hours per week	Injuries not caused by a specific identifiable event	The Oslo Sports Trauma Research Center (OSTRC) Overuse Injury Questionnaire	All overuse injuries*: (49) 76.6% Foot/lower leg (14)**: 22.2%, Knee (6)**: 10.0%, Hip (3)**: 5.4%, Lower back (1)**: 1.6, Other anatomical areas (0)**: 0.5% Substantial overuse problems***: (35) 54.7% Foot/lower leg (7)**: 10.8%, Knee (3)**: 4.4%, Hip (2)**: 3.3%, Lower back (0)**: 0.2%

**Continued**

Weiss et al., <sup>38</sup> 2017	Prospective cohort study	Location: New Zealand Sample selection: Expedience	n* = 13 Average age: 24.4 years (SD 4.7) Gender: Male Sport: Basketball Practice duration: 24 weeks	Self-perceived pain and/or stiffness that occurred during and/or following sport training or matches and continuing for a minimum of three days	The Oslo Sports Trauma Research Center (OSTRC) Overuse Injury Questionnaire	All overuse injuries*: (8)** 63.0% Lower back (3)**: 25.9%, Knee (3)**: 24.4%, Ankle (2)**: 12.8% Substantial overuse problems***: (1)** 7.4% Knee (0)**: 3.2%, Lower back (0)**: 2.7%, Ankle (0)**: 1.5%
Worner et al., <sup>32</sup> 2019	Descriptive epidemiology study	Location: Sweden Sample selection: Expedience	n* = 101 Average age: 22.0 years (SD 4.9) for boys and 21.0 years (SD 3.9) for girls Gender: Male and female Sport: Ice hockey (goalkeepers) Practice duration: N/A	Gradual onset injuries	The Oslo Sports Trauma Research Center (OSTRC) Overuse Injury Questionnaire	All overuse injuries*: (28)** 28.1% Substantial overuse problems***: (10)** 10.0%

n, sample size; SD, standard deviation; N/A, not applicable

\* Corresponds to the number of athletes used to investigate the prevalence in these studies

\*\* Corresponds to the absolute prevalence of overuse injuries in athletes

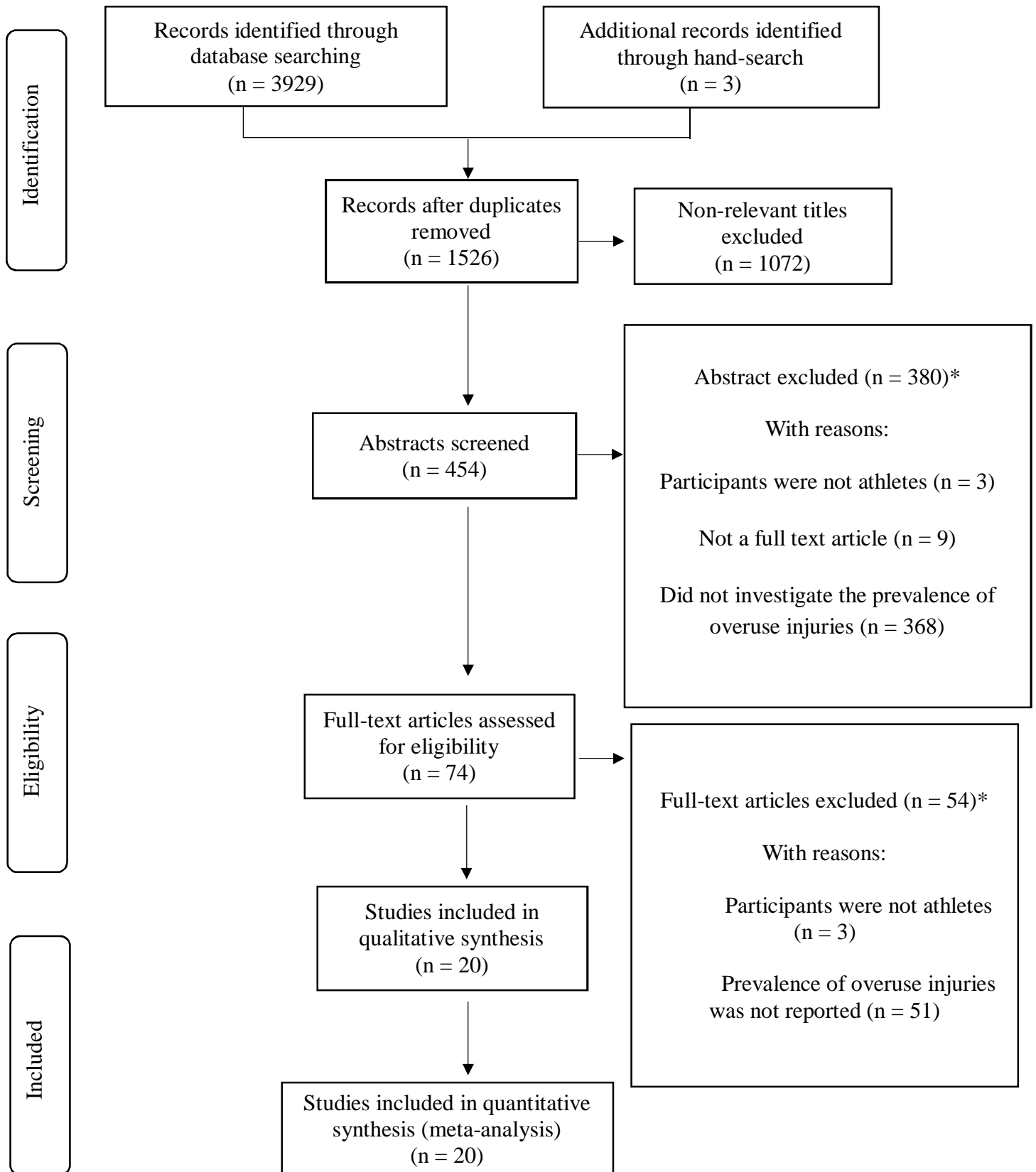
\*\*\* Substantial problem: overuse problem causing moderate/severe reductions in training volume or sports performance, or complete inability to participate in training or competition.

Table 2. Methodological quality of the included studies (n = 20)

Study	1	2	3	4	5	6	7	8	9	Overall score (0-9)
Aasheim et al., <sup>11</sup> 2018	N	N	N	Y	Y	Y	Y	Y	Y	6
Andersen et al., <sup>23</sup> 2013	Y	N	N	Y	Y	Y	Y	Y	Y	7
Clarsen et al., <sup>40</sup> 2010	Y	Y	N	Y	Y	N	Y	Y	Y	7
Clarsen et al., <sup>24</sup> 2015	Y	Y	N	Y	Y	Y	Y	Y	Y	8
Cumps et al., <sup>25</sup> 2007	Y	Y	N	Y	Y	N	Y	Y	Y	7
Delfino Barboza et al., <sup>26</sup> 2018	Y	Y	N	N	Y	Y	Y	Y	N	6
Docking et al., <sup>34</sup> 2018	N	U	Y	N	Y	Y	Y	Y	Y	6
Koh et al., <sup>27</sup> 2017	Y	Y	N	Y	Y	N	Y	Y	U	6
Lemoyne et al., <sup>10</sup> 2017	Y	Y	N	Y	Y	N	Y	Y	N	6
Leppänen, et al., <sup>28</sup> 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Magno e Silva et al., <sup>29</sup> 2013	N	Y	N	U	Y	Y	U	Y	U	4
Matsuura et al., <sup>33</sup> 2020	Y	U	N	Y	Y	N	U	U	Y	4
Nagano et al., <sup>39</sup> 2019	Y	Y	N	Y	Y	Y	Y	Y	Y	8
Nordstrom et al., <sup>35</sup> 2020	N	Y	N	N	Y	Y	Y	U	Y	5
Pastor et al., <sup>36</sup> 2015	N	N	N	U	U	N	U	N	U	0
Rejeb A et al., <sup>37</sup> 2017	N	Y	N	N	Y	Y	Y	Y	Y	6
Tenforde et al., <sup>30</sup> 2011	N	Y	Y	Y	Y	N	Y	Y	N	6
Von Rosen et al., <sup>31</sup> 2016	N	Y	N	U	Y	Y	Y	Y	Y	6
Weiss KJ et al., <sup>38</sup> 2017	Y	Y	N	U	Y	Y	Y	Y	Y	7
Worner et.al., <sup>32</sup> 2020	Y	U	N	Y	Y	Y	Y	Y	Y	7

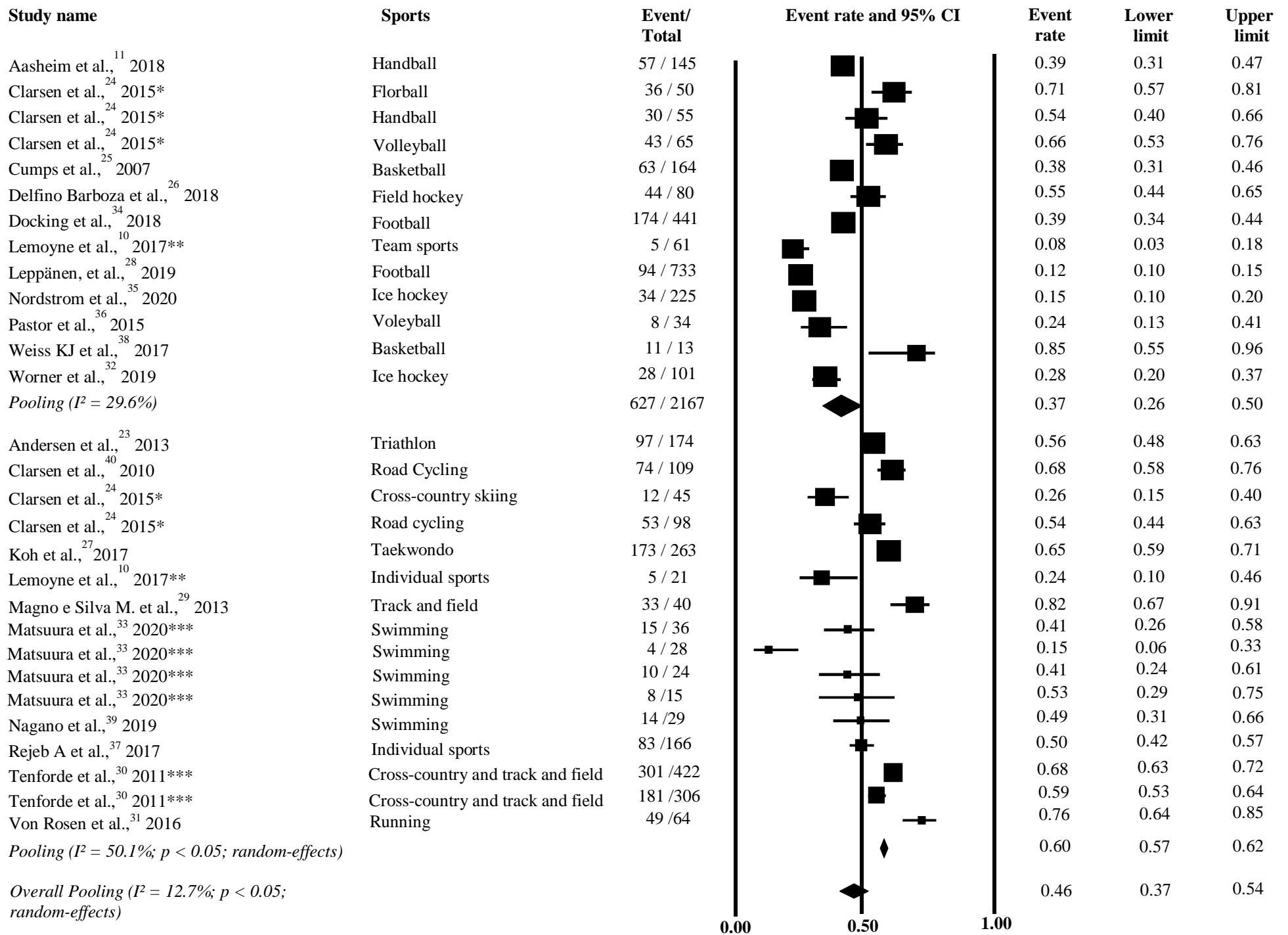
1. Was the sample frame appropriate to address the target population?
2. Were study participants sampled in an appropriate way?
3. Was the sample size adequate?
4. Were the study subjects and the setting described in detail?
5. Was the data analysis conducted with sufficient coverage of the identified sample?
6. Were valid methods used for the identification of the condition?
7. Was the condition measured in a standard, reliable way for all participants?
8. Was there appropriate statistical analysis?
9. Was the response rate adequate, and if not, was the low response rate managed appropriately?
10. Y, yes; N, no; U, unclear; N/A, not applicable.

Figure 1. PRISMA flow-chart of studies through the review.



\*Abstracts and potentially relevant full-texts could be excluded due to more than one inclusion criterion.

Figure 2. Meta-analysis for overall prevalence of overuse injuries and subgroup analysis for team and individual sports.



\* Study reported prevalence data separately for sports modalities.

\*\*Study reported prevalence data grouped into individual and team sports modalities.

\*\*\*Study reported prevalence data separately for females and males.



#### 4 CONSIDERAÇÕES FINAIS

As lesões por *overuse* são prevalentes nos atletas, embora seja ainda pouco mensurada de maneira eficaz, já que a prática esportiva exige altos níveis de esforço físico e uma relação de capacidade e demanda muscular equilibrada, como em esportes em que há movimentos repetitivos. Por ser de difícil identificação, por conta das características da lesão e por não necessariamente afastar o atleta da prática esportiva, as lesões por *overuse* podem ser subestimadas. Dessa forma, pesquisas sobre o assunto são importantes para dar maior evidência para esse tipo de lesão e permitir melhorias na prática clínica.

A partir da análise criteriosa dos artigos selecionados, pôde-se averiguar que esta revisão sistemática com meta-análise demonstrou que a prevalência geral foi de 46,0% (CI 95% 37,0 a 55,0), a prevalência de lesões por *overuse* em esportes individuais foi de 58,0% (IC95%: 51,0 a 65,0%) e a de esportes coletivos foi de 37,0% (IC95%: 30,0 a 50,0%). Esses resultados podem ser explicados pelo fato de que a demanda esportiva na categoria individual está concentrada em um atleta, onde este pode estar mais propenso a um regime de treinamento altamente repetitivo, podendo assim resultar em um processo cumulativo de danos nos tecidos e, conseqüentemente, à ocorrência das lesões por *overuse*.

Portanto, diante desse fato, é relevante que estudos futuros investiguem melhor a natureza e a demanda específica de cada tipo de esporte, explicando as diferenças nas prevalências de lesões por *overuse* entre esportes individuais e coletivos. Além disso, é igualmente importante que os próximos estudos acerca do tema em questão, utilizem procedimentos padronizados para extrair dados de prevalência de lesão por *overuse*, para que seja possível uma comparação dos resultados. As comparações dos resultados associados ao estudo dos mecanismos de lesão contribuem para a prevenção de lesões e um tratamento eficiente e focado nas deficiências musculares dos atletas, diminuindo os efeitos negativos da lesão, como a queda do desempenho e da capacidade de participação do atleta durante a prática esportiva. Outro fator relevante a ser investigado em estudos futuros, é a prevalência de lesões por *overuse* em atletas paraolímpicos, visto que apenas um estudo composto por essa população foi encontrado na seleção dos artigos dessa revisão.

## REFERÊNCIAS

1. FULLER, C. *et al.* Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. **Br J Sports Med.**, v. 40, n. 3, p. 1936-201, mar. 2006.
2. CUFF, S. *et al.* Overuse injuries in high school athletes. **Clin Pediatr (Phila).**, v. 49, n. 8, p. 731-736, ago. 2010.
3. Di FIORI, J. Evaluation of overuse injuries in children and adolescents. **Curr Sports Med Rep.**, v. 9, n. 6, p. 372-378, nov/dez. 2010.
4. HOCH, A. *et al.* Stress fractures and knee injuries in runners. **Phys Med Rehabil Clin N Am.**, v. 16, n. 3, p. 749-777, ago. 2005.
5. BONZA, J. *et al.* Shoulder injuries among United States high school athletes during the 2005-2006 and 2006-2007 school years. **J Athl Train.**, v. 44, n. 1, p. 76-83, fev. 2009.
6. CASSAS, K. *et al.* Childhood and adolescent sports related overuse injuries. **Am Fam Physician.**, v. 73, n. 6, p. 1014-1022, mar. 2006.
7. VON ROSEN, P. *et al.* High Injury Burden in Elite Adolescent Athletes: A 52-Week Prospective Study. **J Athl Train.**, v. 53, n. 3, p. 262-70, mar. 2018.
8. VON ROSEN, P. *et al.* Substantial injuries influence ranking position in young elite athletes of athletics, cross-country skiing and orienteering. **Scand J Med Sci Sports.**, v. 28, n. 4, p. 1435-42, abr. 2018.
9. KOX, L.S. *et al.* Prevalence, incidence and risk factors for overuse injuries of the wrist in young athletes: a systematic review. **Br J Sports Med.**, v. 49, n. 18, p. 1189-1196, set. 2015.
10. SOBHANI, S. *et al.* Epidemiology of ankle and foot overuse injuries in sports: A systematic review. **Scand J Med Sci Sports.**, v. 23, n. 6, p. 669-686, jun. 2012.
11. TENFORDE, A. S. *et al.* Prevalence and Anatomical Distribution of Bone Stress Injuries in the Elite Para Athlete. **Am J Phys Med Rehabil.**, v. 98, n. 11, p. 1036-1040, nov. 2019.

12. CLARSEN, B. *et al.* The Oslo sports trauma research center questionnaire on health problems: A new approach to prospective monitoring of illness and injury in elite athletes. **Br J Sports Med.**, v. 48, n. 9, p. 7546760, fev. 2013.
13. AASHEIM, C. *et al.* Prevalence and burden of overuse injuries in elite junior handball. **BMJ Open Sport Exerc Med.**, v. 4, n. 1, e000391, 26 jun. 2018.
14. BARNES, D. A. *et al.* An analysis of 100 symptomatic baseball players. **Am J Sports Med.**, v. 6, n. 2, p. 62667, mar/abr. 1978.
15. BAHR, R. No injuries, but plenty of pain? On the methodology for recording The prevalence of overuse injury overuse symptoms in sports. **Br J Sports Med.**, v. 43, n.13, p. 9666972, dez. 2009.
16. PASULKA, J. *et al.* Specialization patterns across various youth sports and relationship to injury risk. **Phys Sportsmed.**, v. 45, n. 3, p. 344-352, set. 2017.
17. LEMOYNE, J. *et al.* Analyzing injuries among university-level athletes: prevalence, patterns and risk factors. **J Can Chiropr Assoc.**, v. 61, n. 2, p. 88-95, ago. 2017.
18. HINDS, N. *et al.* A systematic review of shoulder injury prevalence, proportion, rate, type, onset, severity, mechanism and risk factors in female artistic gymnasts. **Phys Ther Sport.**, v. 35, p. 106-115, jan. 2019.
19. KRAAN, R. *et al.* Incidence, prevalence, and risk factors for elbow and shoulder overuse injuries in youth athletes: A systematic review. **Transl Sports Med.**, v. 2, p. 186-195, mar. 2019.
20. MUNN, Z. *et al.* The Joanna Briggs Institute Reviewers Manual 2014. The Systematic Review of Prevalence and Incidence Data. Adelaide (Australia): **The Joanna Briggs Institute**, 2014. Disponível em: <https://nursing.lsuhs.edu/JBI/docs/ReviewersManuals/Prevalence-and-Incidence-Data.pdf>. Acesso em: 11 mar. 2020.
21. HIGGINS, J.P. *et al.* Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0. **The Cochrane Collaboration**. Novembro, 2016. Disponível em: <<https://training.cochrane.org/handbook> >. Acesso em: 11 mar. 2020.

22. MOHER, D. *et al.* Implementing PRISMA-P: recommendations for prospective authors. **Syst Rev.**, v. 5, n. 15, jan. 2016.
23. MUNN, Z. *et al.* Methodological guidance for systematic reviews of observational epidemiological studies reporting prevalence and incidence data. **Int J Evid Based Healthc.**, v. 13, n. 3, p. 1476153, set. 2015.
24. CHARAN, J. *et al.* How to calculate sample size for different study designs in medical research? **Indian J Psychol Med.**, v. 35, n. 2, p. 121-126, abr/jun. 2013.
25. YANG, J. *et al.* Epidemiology of overuse and acute injuries among competitive collegiate athletes. **J Athl Train.**, v. 47, n. 2, p. 198-204, mar/abr. 2012.
26. GUYATT, G. *et al.* GRADE guide-lines:1. Introduction- GRADE evidence profiles and summary of findings tables. **J Clin Epidemiol.**, v. 64, n.4, p. 383-394. abr. 2011.

## Apêndice A . Cronograma

Novembro de 2018: Confecção do pré-projeto.

Março de 2019: Mudanças no pré-projeto e atualização do tema para revisão sistemática da literatura.

Junho de 2019 a Outubro de 2019: Busca bibliográfica e seleção dos artigos a serem lidos na íntegra.

Novembro de 2019: Leitura e classificação dos artigos pré-selecionados.

Janeiro de 2020: Produção do artigo científico e texto do trabalho de conclusão de curso.

Agosto de 2020: Correções finais no texto do trabalho de conclusão de curso.

15/09/2020: Entrega do trabalho de conclusão de curso.

## Apêndice B . Lista de palavras usadas para as buscas

*Combinações usadas no OVID (Medline, Embase, AMED):*

1. prevalence.mp. or Prevalence/
2. incidence.mp. or Incidence/
3. epidemiolog\$.mp.
4. probability.mp. or Probability/
5. athlete\$.mp. or Athletes/
6. sports/ or Athletic Injuries/ or Sportsperson.mp.
7. sports Medicine/ or Sportsman.mp.
8. sportswoman.mp.
9. overuse.mp.
10. overuse adj injur\$.mp
11. sport adj injur\$.mp
12. 1 or 2 or 3 or 4
13. 5 or 6 or 7 or 8
14. 9 or 10 or 11
15. 12 and 13 and 14

*Combinações usadas no EBSCO (SportDiscus and Cinahl):*

- S1 prevalence.mp
- S2 incidence
- S3 epidemiolog\*
- S4 probability
- S5 athlete\*
- S6 Sportsperson
- S7 Sportsman
- S8 Sportswoman

S9 overuse

S10 overuse injuries

S11 sports injuries

S12 S1 OR S2 OR S3 OR S4

S13 S5 OR S6 OR S7 OR S8

S14 S9 OR S10 OR S11

S15 S12 AND S13 AND S1