



# Incidence, prevalence and nature of injuries in padel: a systematic review

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## ABSTRACT

**Objective** It is unclear what the incidence, prevalence and nature of injuries are that can occur during playing padel. This study aimed to systematically review the incidence, prevalence and nature of injuries in padel. **Method** A literature search was performed up to December 2022 through MEDLINE Ovid, PubMed, Cochrane Library, SportsDiscus and CINAHL. Following database search, article retrieval and title and abstract screening, articles were assessed for eligibility against predefined criteria. Studies were assessed for methodological quality. Data on injuries' prevalence, incidence and nature of injuries were extracted, analysed and described in a descriptive statistical manner which did not include a pooling strategy as part of a formal meta-analysis. **Results** Eight studies with 2022 participants were included (range of mean age: 31–57). The incidence rate was 3 injuries per 1000 hours of padel training and 8 injuries per 1000 matches of padel practice. The overall prevalence range was 40%–95%. The elbow was the most common anatomical site of injury, followed by the knee, shoulder and lower back. Tendinous and muscular injuries were the most reported injury types. **Conclusion** Injuries are common among padel players, with an incidence rate of 3 per 1000 hours of padel training and 8 per 1000 matches of padel practice—as based on limited literature. The overall prevalence range was 40%–95%. The elbow was the most frequently reported anatomical region concerning location injury distribution, and injuries were mainly of tendinous or muscular origin.

## INTRODUCTION

Padel is a contemporary doubles racket sport that originated in Acapulco, Mexico in 1962. The sport follows a scoring system and rules similar to tennis, with two pairs of players competing against each other. However, the key distinction lies in the enclosed synthetic glass and metal court, allowing the ball to rebound off the lateral and back walls. The court measures 20 m×10 m and features a tennis-like net dividing it in half. Each half court includes two service boxes, marked by a service line positioned 6.95 m away from the net. These court specifications, along with the presence of walls, result in the

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ There is a clear research gap on the knowledge concerning the incidence and prevalence of injuries in the sport of padel. Moreover, it is unclear which type of injuries occur during this sport.

## WHAT THIS STUDY ADDS

⇒ This study adds new findings to the literature summarising the literature on padel injuries finding that injuries to the musculoskeletal system are relatively common in padel. The most frequently located injury location was the elbow. As such, this study can function as a stepping stone towards preventive interventions for this sport specifically.

following specific movements: fast-paced lateral movements, quick changes in direction and explosive movements towards the net.<sup>1–3</sup> Padel is a physically demanding sport that places specific physiological demands on players. To perform at their best, padel players need to possess a combination of physical attributes, including cardiovascular endurance, strength, power, agility, flexibility and mental resilience.<sup>4,5</sup>

The sport is increasing in popularity with a steadily growing number of players and courts in more than 40 countries.<sup>6,7</sup> The potential dangers of playing padel have highlighted the need to better understand the incidence, prevalence and nature of injuries among recreational and professional athletes.<sup>2,6,8,9</sup> Although the popularity of padel has been growing exponentially, knowledge of the injury rates is limited. There is no consensus on the definition of injury provided by the International Padel Federation, which may cause misdiagnosis and under-reporting of injuries. Moreover, solely a handful of studies are available on the epidemiology and nature of injuries during padel.<sup>6,10–12</sup> The lack of reporting on injuries in padel within the scientific literature is a significant limitation that hinders our understanding of the sport's injury landscape. The limited number of studies examining padel injuries restricts the availability of reliable and robust



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data on injury rates, mechanisms and associated factors. This knowledge gap undermines our ability to develop evidence-based injury prevention strategies, implement targeted interventions, and ultimately promote the safety and well-being of padel players.

Therefore, this study aimed to systematically review the incidence, prevalence and nature of injuries occurring in this sport. The clinical relevance of this study relates to increasing insight into the epidemiology and type of injuries which will guide future research by building baseline data and inform the development of interventions for managing and preventing the reported injuries in this specific racket sport—as understanding the burden of the injury in this sport is the first step of the ‘Sequence of Prevention’ in creating targeted injury prevention strategies.<sup>13 14</sup>

## MATERIALS AND METHODS

### Registration and PE(C)O question

This review was submitted for registration in the International Prospective Register of Systematic review on the 17 January 2023 and was accepted on the first of March 2023 with reference number CRD42023387984. Our PE(C)O<sup>15</sup> question was as follows: what are the incidence and prevalence rates as well as the nature of injuries (outcome(s)) in recreational and professional padel players (population) performing padel training or matches (exposure)? As there was no formal comparison group included, the C of the PECO was not included.

### Literature search strategy

A systematic literature review was performed and reported according to the methodology of the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses.<sup>16 17</sup> A comprehensive search of MEDLINE Ovid, PubMed, Cochrane Library, SportsDiscus and CINAHL databases was performed from inception to 17 December 2022, for potentially eligible articles. The following keywords were used: “padel”, “paddle tennis”, “paddle-tennis”, “injury” and “injuries”, including synonyms and MeSH terms. The full search strategy is outlined in online supplemental appendix 1. Duplicates were subsequently removed.

### Study selection and eligibility criteria

Two independent reviewers (JD and KSE) screened titles and abstracts using predefined criteria in Rayyan.<sup>18</sup> Subsequently, articles were screened for full text and included when they met the inclusion criteria. Discordant judgement in study inclusion was resolved by consensus discussion. In case of persistence of discussion, the senior author (BMP) was questioned whether to include or exclude the publication. One author searched the reference lists of all included studies to identify any other potential articles for inclusion. Studies were included if they reported incidence (injuries per unit of playing time), prevalence (fraction of injured players per reported time frame) or injury type (as the fraction

of injuries) among a population of padel players participating in matches or training. Self-reported injury data and data on medical encounters (MEs) were included in this review as defined by Schweltnus *et al.*<sup>19</sup> Including self-reported injury data allows reporting on a broader scope of injuries as, in our opinion, not all padel players will report their injury to a medical professional.<sup>20</sup> No limit was placed on the geographical region of participation, age and sex of participants or publication date. Conference proceedings, editorials, commentaries, book chapters, opinion-based papers and reviews were excluded. Solely peer-reviewed articles were included. There was no limit on the language of the published studies: in case of inclusion of studies of language not being able to be understood by one of the authors, an external referent was requested to translate the manuscript.

### Methodological quality assessment

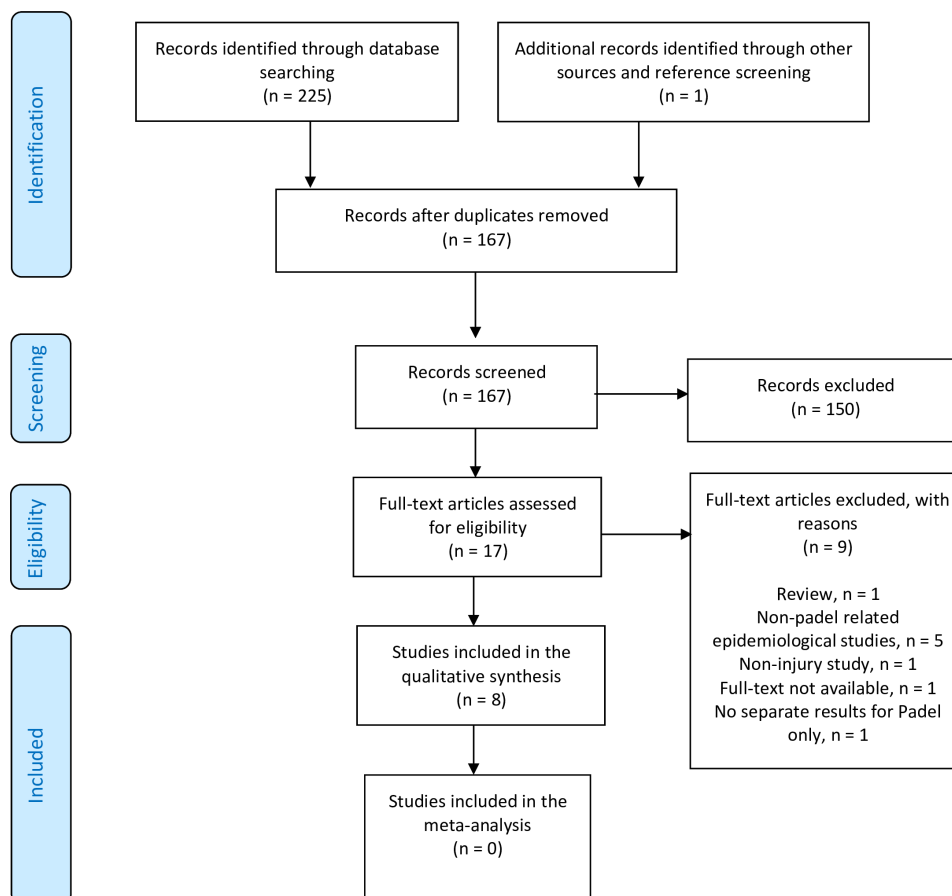
All articles’ evidence level was assessed using the Oxford Center of Evidence-Based Medicine model.<sup>21</sup> The methodological quality of the studies was evaluated by two independent reviewers (JD and KSE) using the validated Critical Appraisal Tool for prevalence studies from the Joanna Briggs Institute to indicate the methodological quality of each study.<sup>22</sup> All studies were rated on nine criteria. Discrepancies between the two authors were resolved through consensus. Without consensus, the senior author (BMP) was requested to decide the methodological quality.

### Data extraction

The following study characteristics were retrieved and extracted by one author: authors, year of publication and study design. Extracted data from the final selection of studies consisted of study design, year of study, population (sample size, age, sex), study location, the aim of the study, injury definition duration/follow-up, injury outcomes (incidence, prevalence, anatomical site, tissue type, specific diagnosis, severity). The extraction of the data was checked by the senior author (BMP).

### Data analysis

Data analysis was performed by reporting variables extracted from the included studies. The incidence of injury was reported per 1000 hours of playing padel or per 1000 padel players per season with confidence intervals (CIs) (90% or 95% CI), while the period prevalence of injury was reported as the percentage of injured padel players per specific period. Self-calculated incidence and/or prevalence outcomes were used whenever hours of play were not reported as the primary outcome point. The injury frequency (n, %) was reported for anatomical site, tissue type and pathology-type/specific diagnosis categories. The frequency (n, %) and mean severity scores were reported for injury severity. Attempts were made to combine comparable data, however, in case of heterogeneous nature and reporting of data among the



**Figure 1** PRISMA flow diagram. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

included studies, a formal meta-analysis would not be performed.

## RESULTS

### Identification of studies

After the removal of duplicates, the literature search resulted in 167 articles. After screening titles and abstracts, 15 articles were included for full-text screening. A total of eight articles<sup>11 12 23–28</sup> were included for analysis (figure 1).

### Study characteristics

The publication dates and respective journals are presented in table 1. A total of 2022 participants were studied. The mean age ranged from 31 to 57 and is shown in table 1. Data on sex were available for all participants. The review included predominantly males (n=1516; 75%) vs 506 females (25%). Data were mainly collected in cross-sectional or retrospective studies. All<sup>11 12 23–27</sup> but one<sup>28</sup> study reported the data through a self-administered questionnaire. The difference in injury definitions and study designs as well as the heterogeneity of the included populations made it impossible to pool and compare results through a formal meta-analysis.

### Quality assessment and level of evidence

The mean score of the quality assessment was 7/9 (range 5–8). The quality assessment for each study is presented in table 2. The level of evidence rating of each article is shown in table 1.

### Injury

Injury outcomes are presented in tables 3 and 4. Reporting of injuries was based on the definitions used by the authors of the included articles. Figure 2 gives an overview of the most important outcomes.

### Anatomical site of the injury

Four out of eight (50%) studies reported the injury location as the upper or lower body (upper or lower extremities). Two (50%) studies reported the upper limbs/upper extremity as the most common injury location,<sup>11 28</sup> and two (50%) reported the lower limbs/lower extremity as the most common site of injury.<sup>11 25</sup> Five out of eight (63%) studies gave more detailed information and reported specific joints as injury location.<sup>12 23–26</sup> Five out of five (100%) studies reported the elbow as the most frequent injury site. However, one<sup>26</sup> study only analysed upper body injuries in amateur padel players.<sup>12 23–26</sup>

**Table 1** Study characteristics

Authors (year of publication) journal	Data collection	Population and setting	Method(s)	Level	No of participants	Mean age	Gender	BMI	Level of evidence	Quality assessment
Castillo-Lozano and Casuso-Holgado <sup>23</sup> (2015) <i>A comparison musculoskeletal injuries among junior and senior paddle-tennis players. Sci. Sport.</i>	Cross-sectional: Data recorded via a self-administered questionnaire. No follow-up.	Spanish recreational Padel players <20 years or >55 years, practising paddle-tennis >3 times/week or >5 hours/week.	Participants were asked by a physiotherapist about the injuries they had suffered during their paddle-tennis career. Participants completed the International Physical Activity Questionnaire.	18% beginner 55% intermediate 22% advanced 5% professional	60	39±21	90% male 10% female	24.1±4.3	2b	6/9
Castillo-Lozano and Casuso-Holgado <sup>12</sup> (2017) <i>Incidence of musculoskeletal sports injuries in a sample of male and female recreational paddle-tennis players. J. Sports Med. Phys. Fitness.</i>	Cross-sectional: Data recorded via a self-administered questionnaire. No follow-up.	Spanish padel players >18 years, practising paddle-tennis >3 times/week or >5 hours/week.	Participants were asked by a physiotherapist about the injuries they had suffered during their paddle-tennis career.	22% beginner 63% intermediate 24% advanced 4% professional	113	38.4±16.8	48% male 52% female	23.9±4.1	2b	7/9
Castillo-Lozano <sup>24</sup> (2017) <i>Epidemiology and prevention strategies for the musculoskeletal injuries in the paddle-tennis senior players. Sci. Sport.</i>	Cross-sectional: Data recorded via a questionnaire. No follow-up.	Spanish padel players >50 years, practising paddle-tennis >3 times/week or >5 hours/week. Participants had suffered an injury playing paddle-tennis.	Data collected by physical therapist for 3 days at a padel club. Participants were asked to report the injuries sustained during their paddle-tennis career and participants completed the International Physical Activity Questionnaire.	6.1% beginner 79.4% intermediate 14.5% advanced	131	56.8±4.6	82% male 18% female	26.2±4.3	2b	6/9
García-Fernández et al <sup>25</sup> (2019) <i>Epidemiology of injuries in professional and amateur Spanish paddle players. Rev. Int. Med. Cienc. Act. Física Deport</i>	Self-administered retrospective questionnaire. No follow-up.	Spanish padel players between 14–65 years, all playing levels, both sexes, members of the Spanish Padel Federation from five clubs in the region of Madrid	Data collected between 1 February 2017 and 30 March 2017 on injuries occurring during training or competitions between January 2016 and December 2016 using a questionnaire.	61% amateur. 26% semiprofessional. 4.5% professional. 8.5% coaches.	478	Mean age N.R.	69.5% male 30.5% female	N.R.	4	8/9
Muñoz et al <sup>26</sup> (2022) <i>Incidence of upper body injuries in amateur padel Players. Int. J. Environ. Res. Public Health</i>	Cross-sectional: Data recorded via a questionnaire through Google Forms. No follow-up.	Amateur padel players from 12 different countries. Questionnaire taken as García-Fernández et al <sup>25</sup>	The participants filled out an online questionnaire using Google Forms.	43% of included players: <5 years of experience. 57% of included players: ≥5 years of experience	950	31.7 (no SD)	85% male 15% female	N.R.	4	5/9

Continued

**Table 1** Continued

Authors (year of publication) journal	Data collection	Population and setting	Method(s)	Level	No of participants	Mean age	Gender	BMI	Level of evidence	Quality assessment
Priego Quesada et al <sup>11</sup> (2018) <i>Examination of the risk factors associated with injured recreational padel players in Spain. J. Sports. Med. Phys. Fit.</i>	Self-administered retrospective questionnaire. No follow-up.	Spanish padel players ≥18 years old, playing ≥ once every 2 weeks. Competitive level players excluded.	Data collected between September 2014 and March 2015 using a questionnaire. A link to questionnaire was sent to organisations with a vested interest in padel, such as padel clubs and the Padel Spanish Federation). Follow-up reminders were sent on a monthly basis during the 6-month study period.	Recreational athletes Experience: 14% <1 year 45% 1–5 years 20% 6–10 years 21% >10 years	80	46% of the included population was between 30 and 40 years old	57.5% male 42.5% female	N.R.	4	7/9
Sánchez Alcaraz-Martínez et al <sup>27</sup> (2019) <i>Descriptive study about injuries in padel: relationship with gender, age, players' level and injuries location. Rev. Andal. Med. Deporte.</i>	Descriptive retrospective study: Data recorded via a questionnaire (self-reported) on sports injuries which was completed by the padel players. No follow-up.	From a sample of 2020 members of Spanish Padel Federation, a random sample of a minimum of 92 players were selected.	Spanish padel players were asked during two tournaments in October 2016 to complete the questionnaire on injuries sustained during the last year of playing padel. No information on whether injuries were during practice or competition.	'First' category: 18% 'Second' category: 24% 'Third' category: 31% 'Fourth' category: 28%	148	34.0±9.9	51% male 49% female	N.R.	4	6/9
Valério et al <sup>28</sup> (2022) <i>Injuries in competitive sports: an analysis of Brazilian padel athletes. Fisioter Pesqui.</i>	Cross-sectional: Data recorded via a questionnaire through an interview. No follow-up.	Brazilian padel players of both sexes, who competed in the fourth Stage of the Brazilian Padel Circuit in 2017. The competition was based in the municipality of Porto Alegre, Rio Grande do Sul. This was the last stage of the main championship of the sport in Brazil, played by athletes from different states.	Two individually trained interviewers approached the athletes after the end of their championship matches during the fourth stage of the Brazilian Padel Circuit. Structured interviews that addressed injury epidemiology in the 8 months prior to this study were conducted. Injuries sustained during practice and competition.	Professional athletes: 64% Aspiring professionals: 36%	62	31.0±7.3	65% male 35% female	N.R.	2b	7/9

BMI, body mass index; N.R., not reported.

**Table 2** Methodological quality of the included studies as assessed with the critical appraisal tool from the joanna briggs institute

Authors (year of publication) title	1	2	3	4	5	6	7	8	9	Overall score (0–9)
Castillo-Lozano and Casuso-Holgado <sup>23</sup> (2015) <i>A comparison musculoskeletal injuries among junior and senior paddle-tennis players</i>	1	1	U	1	1	1	1	0	U	6/9
Castillo-Lozano and Casuso-Holgado <sup>12</sup> (2017) <i>Incidence of musculoskeletal sports injuries in a sample of male and female recreational paddle-tennis players</i>	1	1	U	1	1	1	1	0	U	6/9
Castillo-Lozano <sup>24</sup> (2017) <i>Epidemiology and prevention strategies for the musculoskeletal injuries in the paddle-tennis senior players</i>	1	1	U	1	1	1	1	1	U	7/9
García-Fernández et al <sup>25</sup> (2019) <i>Epidemiology of injuries in professional and amateur Spanish paddle players.</i>	1	1	U	1	1	1	1	1	1	8/9
Muñoz et al <sup>26</sup> (2022) <i>Incidence of Upper Body Injuries in Amateur Padel Players</i>	1	1	U	1	1	0	1	0	U	5/9
Priego Quesada et al <sup>11</sup> (2018) <i>Examination of the risk factors associated with injured recreational padel players in Spain</i>	1	1	U	1	1	1	1	1	U	7/9
Sánchez Alcaraz-Martínez et al <sup>27</sup> (2019) <i>Descriptive study about injuries in padel: relationship with gender, age, players' level and injuries location.</i>	1	1	U	1	1	0	1	1	U	6/9
Valério et al <sup>28</sup> (2022) <i>Injuries in competitive sports: an analysis of Brazilian padel athletes</i>	1	1	U	1	1	1	1	1	U	7/9

### Tissue type, pathology type and specific diagnosis

Four out of eight (50%) studies reported the type of tissue or structure of the injuries.<sup>11 25–27</sup> In three<sup>11 25 26</sup> out of four (75%) studies, tendon injuries were most commonly reported, followed by muscle injuries, while muscle injuries were most common in the fourth study.<sup>27</sup> Specific pathology type and/or diagnosis were not mentioned in three out of eight (38%) studies.<sup>26–28</sup> The remaining five studies<sup>11 12 23–25</sup> mentioned a specific pathology type and/or diagnosis. It was not possible to extract one most common specific pathology and/or diagnosis. However, overall, tennis elbow (from now on referred to as common extensor tendinopathy, also known as lateral epicondylitis) was most frequently reported among the different studies.

### Injury severity

Injury severity was reported by three studies out of eight studies (38%).<sup>11 25 28</sup> García-Fernández et al<sup>25</sup> classified the injury severity based on the classification of Pluim et al<sup>29</sup>: 30% of the injuries were minor, 28% were of moderate severity and severe or minimal injuries were not reported (hence the percentages potentially not adding up to 100%). Valério et al<sup>28</sup> also classified their injury severity with a similar system, with 65% of the injuries being mild, 19% being moderate and 16% being severe. Priego Quesada et al<sup>11</sup> assessed the injury severity with an associated time to recover: 53% of the athletes needed more

than 1 month to fully recover from their injury, 13% of the athletes required to request a medical leave, while 9% required less than a week to recover from the injury.

### Training versus competition

Injuries occurring during training or competition were reported in two studies.<sup>27 28</sup> Sánchez Alcaraz-Martínez et al<sup>27</sup> indicated that 58% of the lesions occurred during training, while 42% occurred during competition. Valério et al<sup>28</sup> stated that 44%–64% of the injuries occurred during competition, 20%–48% during padel training and 8%–16% during physical training.

## DISCUSSION

This study aimed to systematically review the literature on padel injuries to provide an overview of the characteristics, prevalence and nature of these injuries. Our results showed that injuries are common among padel players, with an incidence rate of 3 injuries per 1000 hours of padel training and 8 injuries per 1000 padel matches, and an overall prevalence ranging from 40% to 95%. This wide range may be due to differences in the population, the methods used to collect data and the definition of injury used in different studies.

Comparing the incidence, prevalence and nature of injuries occurring during padel as summarised in this systematic review to other racquet sports can provide important information on the relative risk of injuries

**Table 3** Padel injury-related outcomes #1

Authors (year of publication) title	Injury definition	Injury site/anatomical region
Castillo-Lozano and Casuso-Holgado <sup>23</sup> (2015) <i>A comparison musculoskeletal injuries among junior and senior paddle-tennis players</i>	'A situation in which the athlete has been forced to go to emergency services and/or that would have forced the athlete to require treatment and/or medical attention during sport of paddle-tennis practice'. <sup>35</sup>	<i>Percentage of individuals reporting injury, senior group/ junior group:</i> Elbow: 37%/10% Low back: 13%/23% Sprained knee: 20%/10% Shoulder: 10%/7% Sprained ankle: 7%/7% Hamstring muscles: 13%/- Plantar fasciitis: 3%/10% Neck: 10%/- Calf: 10%/- Wrist: -/7%
Castillo-Lozano and Casuso-Holgado <sup>12</sup> (2017) <i>Incidence of musculoskeletal sports injuries in a sample of male and female recreational paddle-tennis players</i>	Not defined.	<i>Percentage of individuals reporting injury:</i> Tennis elbow (common extensor tendinopathy): 74.4% Lower back pain or contusion: 20.2% Knee sprain: 15.1% Calf muscles strain: 13.8% Hamstring muscles strain: 12.5% Shoulder pain: 13.1% Ankle sprain: 7.9% Plantar fasciitis: 7.1% Neck pain or contusion: 5.3% Wrist pain: 5.2% Dorsal back pain or contusion: 4.3%
Castillo-Lozano et al <sup>24</sup> (2017) <i>Epidemiology and prevention strategies for the musculoskeletal injuries in the paddle-tennis senior players</i>	'A situation in which the athlete has been forced to go to emergency services and/or that would have forced the athlete to require treatment and/or medical attention during sport of paddle-tennis practice'. <sup>35</sup>	<i>Rate of dispersion of the reported anatomic regions</i> Elbow: 29.8% Low back: 27.5% Sprained knee: 22.9% Tennis-leg: 22.1% Shoulder: 20.6% Sprained ankle: 9.8% Neck: 7.6% Hamstring muscles: 7.4% Plantar fasciitis: 3.8% Wrist: 2.7%
García-Fernández et al <sup>25</sup> (2019) <i>Epidemiology of injuries in professional and amateur Spanish paddle players.</i>	'An injury was considered as any incidence requiring health treatment of any type, or causing absence from training or match play'. <sup>36</sup> Players who had suffered one or several previous injuries must have completely recovered in order to perform an accurate analysis of the consequences of the same. This study included new injuries occurring during the research period, but excluded relapses of previous injuries, chronic injuries, as well as any injuries unrelated to the practice of this sport.	Body part: Lower limbs: 41.57% Upper limbs: 34.94% Trunk: 13.25% Head and neck: 10.24% Anatomic location: Elbow: 20.48% Foot: 11.45% Knee: 10.84% Lumbar spine: 9.04% Shoulder: 8.43% Leg/sural region: 8.43% Neck/cervical spine: 8.43% Ankle: 7.83% Wrist: 4.82% Dorsal spine: 2.42% Other: 9.64%
Muñoz et al <sup>26</sup> (2022) <i>Incidence of Upper Body Injuries in Amateur Padel Players</i>	Not defined.	Location: Elbow: 169 (35%) Shoulder: 165 (34%) Hand: 13 (27%) Forearm: 57 (12%) Wrist: 57 (12%) Arm: 21 (4%)

Continued

Table 3 Continued

Authors (year of publication) title	Injury definition	Injury site/anatomical region
Priego Quesada <i>et al</i> <sup>11</sup> (2018) <i>Examination of the risk factors associated with injured recreational padel players in Spain</i>	'Any unintentional or intentional damage to the body resulting from participation in any padel session or game'. <sup>37</sup>	Body part: Upper extremity: 37.5% Lower extremity: 53.1% Trunk: 9.4% Head: 0%
Sánchez Alcaraz-Martínez <i>et al</i> <sup>27</sup> (2019) <i>Descriptive study about injuries in padel: relationship with gender, age, players' level and injuries location.</i>	An adaptation of the sports injury instrument used by García Gonzalez <i>et al</i> <sup>38</sup> —the instrument was modified to the study population.	Location (total: 151) Lower body: 67 (44%) Upper body: 53 (35%) Trunk: 31 (21%)
Valério <i>et al</i> <sup>28</sup> (2022) <i>Injuries in competitive sports: an analysis of Brazilian padel athletes</i>	The instrument used to characterise possible injuries was the Reported Morbidity Survey (adapted for the sport). <sup>39</sup>	Location Upper limbs: 55%–61% Lower limbs: 27%–36% Trunk: 9%–12%
N.R., not reported.		

associated with this sport. This, is, however, to a certain extent difficult and methodologically inadequate due to the absence of (large) recent systematic reviews on the incidence/prevalence of injuries in other racquet sports, such as tennis, badminton and squash. For example, in a systematic review study by Pluim *et al*,<sup>30</sup> the reported injury incidence varied from 0.05 to 2.9 injuries per player per year, and per hour of play, the reported incidence ranged from 0.04 injuries per 1000 hours to 3.0 injuries per 1000 hours. In two more recent studies (which were not systematic reviews) on competitive adolescent tennis players, the prevalence of injury occurrence ranged from 1.2 to 2.8 injuries per 1000 hours played.<sup>31 32</sup> As these three studies included a mixture of both professional and non-professional athletes, comparing to padel injuries should be performed with caution.

Concerning the occurrence of injuries per anatomic location, we could not determine from our analysis whether the lower extremities were more susceptible to injury than the upper extremities. Comparing this outcome in padel to the same outcome in tennis, Sell *et al*<sup>33</sup> studied the overall injury rates per 1000 match exposures and found a significantly higher injury rate in the lower extremities compared with the trunk and the upper extremities. A recent study of squash players, 76% of the injuries were lower-limb injuries.<sup>34</sup> In padel, the elbow was the most frequently reported site of injury, and common extensor tendinopathy (tennis elbow) was the most commonly reported specific pathology. Several studies have investigated the occurrence of elbow injuries in other racquet sports. Compared with other racquet sports,<sup>33</sup> padel appears to have a higher incidence of elbow injuries. This may be due to the specific nature of the sport, which involves a high number of overhead shots and repetitive movements that place strain on the elbow joint. An interesting finding from this review was the high proportion of tendon injuries reported in padel. This potentially has to do with the fact that the elbow (with the common extensor tendinopathy) was

also the most frequently reported location of injuries, and, as such, may contribute to the high percentage of tendon injuries. The finding may be related to the fact that the elbow is suspect to high mechanical demands due to the continuous eccentric contractions occurring after hitting the ball in such a technical fashion to slow down the speed of the incoming ball as a tactical manoeuvre. Another reason for the high prevalence of the tendinous injuries could be that the padel racquet does not consist of stringing, so the tension is properly regulated during stroke hitting—as previously described by García-Fernández *et al*.<sup>25</sup> Other contributing explanations may be that the high number of overhead shots can place greater stress on the tendons of the elbow than on the muscular components around it, and that in padel double-handed backhands are rarely seen, as opposed to tennis.

Concerning the severity of injuries, three studies<sup>11 25 28</sup> assessed this outcome. As the way of reporting injury severity varied among studies, no specific conclusions could be drawn. However, both García and Valerio reported mostly mild to moderately severe injuries, with Valerio reporting 16% severe injuries. Moreover, comparing the severity of injuries occurring during padel to other racquet sports cannot be considered appropriate. The comparison is complex and depends on various factors—such as level of play, sex, age of players, etc. Therefore, it is essential to investigate further the nature and severity of injuries in racquet sports to develop effective injury prevention and management strategies. Concerning injuries occurring during practice or competition, one of the two studies concluded that more injuries occurred during competition than during practice, while one out of the two studies concluded the opposite. Here again, an appropriate comparison to other sports cannot be performed.

We recognise the limitations of our study. First, most studies included in our review were conducted in Spain, which may limit the generalisability of our findings to other countries. Second, the definition of injury varied across studies, which



**Table 4** Padel injury-related outcomes #2

Authors (year of publication) title	Tissue type	Pathology type/specific diagnosis	Severity	Injuries during competition or training	Incidence/prevalence
Castillo-Lozano and Casuso-Holgado <sup>23</sup> (2015) <i>A comparison musculoskeletal injuries among junior and senior paddle-tennis players</i>	N.R.	Combined with injury site/ anatomical region	N.R.	N.R.	Overall career period prevalence divided among: ▶ Senior group (55–67 years): 87% ▶ Junior group (14–20 years): 60%
Castillo-Lozano and Casuso-Holgado <sup>12</sup> (2017) <i>Incidence of musculoskeletal sports injuries in a sample of male and female recreational paddle-tennis players</i>	N.R.	Combined with injury site/ anatomical region	N.R.	N.R.	Overall career period prevalence: ▶ 85.4% Overall career period prevalence for injury divided among: ▶ Male group: 75.9% ▶ Junior group (14–20 years): 94.9%
Castillo-Lozano <sup>24</sup> (2017) <i>Epidemiology and prevention strategies for the musculoskeletal injuries in the paddle-tennis senior players</i>	N.R.	Combined with injury site/ anatomical region	N.R.	N.R.	N.R.
García-Fernández <i>et al</i> <sup>25</sup> (2019) <i>Epidemiology of injuries in professional and amateur Spanish paddle players.</i>	Tendon: 40.4% Muscle: 30.7% Joints/ligaments: 17.5% Other: 10.2% Bone: 1.2% Skin: 0%	Specific diagnosis: Epicondylitis: 20.5% Plantar fasciitis: 8.4% Neck contractures: 8.4% Lateral ankle sprains: 7.8% Other: 7.8% Rotator cuff tendinitis: 7.4% Lumbar pain: 7.4% Partial rupture of m. gastrocnemius: 6.8% Patellar tendinitis: 5.6% Knee sprain: 3.3% Internal meniscus rupture: 2.3% Achilles tendinitis: 2.3% Thoracic spine contracture: 2.3% Eye contusion: 1.7% Unstable wrist: 1.7% Lumbosciatica: 1.7% Subacromial bursitis: 1.2% Piriformis contracture: 1.2% Gastrocnemius overload: 1.2% Wrist tendinitis: 1.2%	Severity based on classification of Pluim <i>et al.</i> <sup>29</sup> : No time-loss: 40% Minimal: N.R. Minor: 30.1% Moderate: 28.3% Serious: N.R.	N.R.	Personal injury rate (no of sports players injured per 100 sports athletes): ▶ 65.6%. Reported incidence: ▶ 8.44 injuries per 1000 matches. ▶ 2.75 injuries per 1000 hours of padel training.
Muñoz <i>et al</i> <sup>26</sup> (2022) <i>Incidence of Upper Body Injuries in Amateur Padel Players</i>	Tendon: 232 (48%) Muscle: 161 (33%) Ligament: 55 (11%) Bone: 34 (7%)	N.R.	N.R.	N.R.	Reported calculated period prevalence during the past year: ▶ 50.7%
Priego Quesada <i>et al</i> <sup>11</sup> (2018) <i>Examination of the risk factors associated with injured recreational padel players in Spain</i>	Tendon: 43.8% Joint: 28.1% Muscle: 28.1% Bone: 0%	Sprain/strain: 43.8% Muscle contracture/rupture: 21.9% Meniscus pinching/torn: 15.6% Other: 18.8%	53.1% >1 month. 12.5% medical leave. 9.4% <1 week	N.R.	Reported period prevalence of injuries over the past year: ▶ Overall rate: 40% – one injury over past year: 25% – >1 injury over past year: 15%
Sánchez Alcaraz-Martínez <i>et al</i> <sup>27</sup> (2019) <i>Descriptive study about injuries in padel: relationship with gender, age, players' level and injuries location.</i>	Muscle: 68 (45%) Ligament: 34 (23%) Tendon: 30 (20%) Joint: 14 (9%) Bone: 5 (3%)	N.R.	N.R.	87/151 (58%) during training 64/151 (42%) during competition	Reported period prevalence of injuries over the past year: ▶ Overall rate: 71.6% ≥ one injury over the last year.

Continued

Table 4 Continued

Authors (year of publication) title	Tissue type	Pathology type/specific diagnosis	Severity	Injuries during competition or training	Incidence/prevalence
Valério <i>et al</i> <sup>28</sup> (2022) <i>Injuries in competitive sports: an analysis of Brazilian padel athletes</i>	N.R.	N.R.	56 mild (65%) 16 moderate (19%) 14 severe (16%)	44%–64% during competition 20%–48% during padel training 8%–16% during physical training	Reported period prevalence rate past 8 months: ▶ 67.7% ≥1 injury over 8 months (totalling 86 injuries)
N.R., not reported.					

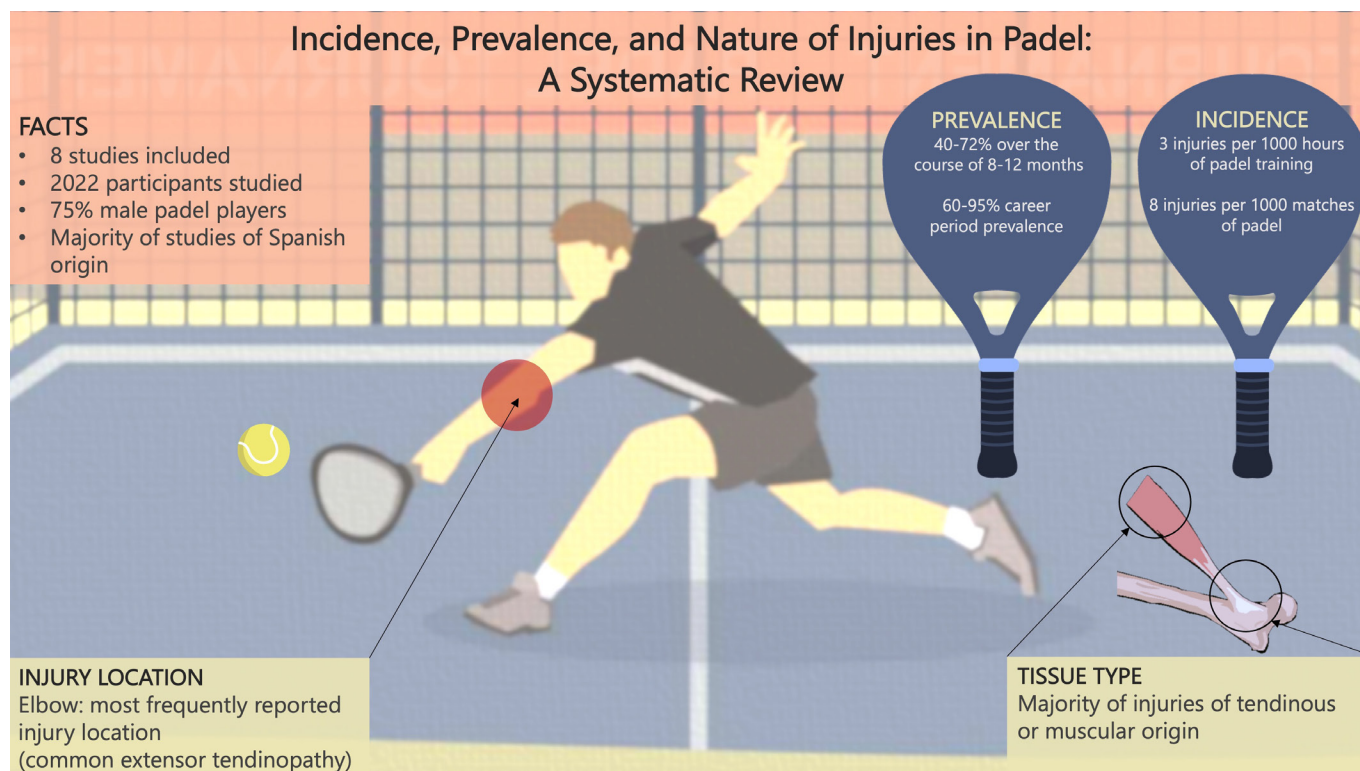
may have resulted in underestimating or overestimating the true prevalence of injuries. Moreover, we did not include an analysis on the assessment of risk factors of injury occurrence in padel players, as there needs to be more data on this. Finally, the quality of the studies varied from relatively low-quality to moderate-quality studies, with some reporting limited information on the methods used to collect data or the population studied. Frequently reported reasons for scoring an ‘unclear’ or a ‘no’ as based on the Joanna Briggs Institute’s critical appraisal checklist were the (in)adequate sample size and the unclarity concerning the adequateness of the response. As such, focus should be on improving these aspects around the methodological quality for future studies on the epidemiology of padel injuries.

Though this review provided a comprehensive overview of the existing literature on padel injuries, there is still a need for further research in this area to improve the understanding of the nature and magnitude. Future studies should consider prospective designs, including larger sample sizes,

longer follow-up periods and more standardised injury definitions and reporting methods. Additionally, more attention should be given to the role of individual player characteristics, playing style and environmental factors, as well as the effectiveness of injury prevention and rehabilitation programmes. A better understanding of the risk factors and prevention strategies of padel injuries could help promote this sport’s safe and sustainable practice.

### CONCLUSION

Our results show that injuries are common among padel players, with an incidence rate of 3 injuries per 1000 hours of padel training and 8 injuries per 1000 padel matches, but based on limited literature. The career prevalence range was 60%–95% while the reported prevalence range over injuries occurring over the past 8–12 months was 40%–72%. The elbow was the most frequently reported injured anatomical region, and injuries mainly were of tendinous or muscular origin.



**Figure 2** Infographic on the most important outcomes of the study.

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