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Sports-Related Ocular Injuries: Incidence, Prevention and Awareness Among Athletes: A Narrative Review

Martyna Czmiel, ORCID https://orcid.org/0009-0008-5448-1176

E-mail: czmielmartyna@gmail.com

Medical University of Silesia in Katowice, 15 Poniatowskiego Street, 40-055 Katowice, Poland

Weronika Ścieglińska, ORCID https://orcid.org/0009-0005-0946-4527

E-mail: weronikascieglinska@gmail.com

Municipal Hospital in Zabrze, 4 Zamkowa Street, 41-803 Zabrze, Silesia, Poland

Antonina Radolinska, ORCID https://orcid.org/0009-0007-5901-1870

E-mail: antonina.radolinska@gmail.com

Medical University of Silesia in Katowice, 15 Poniatowskiego Street, 40-055 Katowice, Poland

Bogumiła Szarek , ORCID https://orcid.org/0000-0002-4760-3808

E-mail: bogumilastrzal@gmail.com

Bonifraters Medical Center Ltd., St. John of God Brothers' Hospital, Kraków, Poland

Rafał Szarek , ORCID https://orcid.org/0009-0001-9118-0769

E-mail: rafalszar@vp.pl

5th Military Hospital with Polyclinic in Cracow, Kraków, Poland

Monika Chlipała , ORCID https://orcid.org/0009-0002-8163-8243

E-mail: monika.chlipala01@gmail.com

St. Luke Provincial Hospital SPZOZ, Lwowska 178A, Tarnów, Poland

Jakub Andrzejewicz , ORCID https://orcid.org/0009-0006-3420-5268

E-mail: andrzejewicz.jakub@gmail.com

Health Care Complex in Dąbrowa Tarnowska, Szpitalna 1, Dąbrowa Tarnowska, Poland

Corresponding Author

Martyna Czmiel, czmielmartyna@gmail.com

Abstract

Background. Eye trauma in sport is common, often severe, and in most cases preventable. It continues to affect athletes from recreational play through professional competition, and although protective eyewear prevents the majority of these injuries, its use is inconsistent from one sport and athlete group to the next.

Aim. This review synthesizes current evidence on the incidence, mechanisms, and prevention of sports-related ocular injuries, focusing on how effective protective eyewear is and how consistently athletes actually wear it.

Material and methods. PubMed was searched for studies on sports-related ocular injuries, their prevention, and eyewear use among athletes. Thirty sources published between 2017 and 2026 met the inclusion criteria and were grouped by theme.

Results. Racquet sports, ball sports, combat sports, and ice hockey accounted for most reported ocular injuries. Eyewear meeting recognized safety standards cut both the frequency and severity of injury substantially, while prescription glasses, contact lenses, and lensless guards gave comparatively little protection. Mandates requiring eyewear were linked to marked drops in injury rates, and the biggest gains came from combining mandates with education. Awareness of eye-injury risk remained low even so, especially among younger and amateur athletes, and eyewear use showed the same pattern.

Conclusions. The case for protective eyewear as a means of preventing sports-related ocular injury is strong, but awareness and adoption still lag behind it at most levels of competition. Pairing athlete and coach education with enforceable eyewear policy looks like the most promising route to reducing preventable vision loss in sport.

Key words: eye injury, ocular trauma, sport, athletes, injury prevention, protective eyewear.

1. Introduction

Vision is fundamental to athletic performance, so ocular injury ranks among the more consequential outcomes an athlete can sustain. Sports-related ocular trauma is a significant but underrecognized cause of preventable visual impairment worldwide. Even a seemingly minor blunt-force impact can leave permanent structural damage, including retinal detachment, hyphema, or vitreous hemorrhage [2]. Open-globe injuries sit at the most severe end of this spectrum, and visual prognosis depends heavily on the severity and location of the primary injury, though eyes presenting with very poor initial vision can still recover meaningfully with timely specialist management [1]. Eye protection, however, has received comparatively little attention in sports medicine next to other protective equipment such as helmets and mouthguards [3].

Three factors largely shape ocular injury risk in sport: the speed of the projectile involved, the degree of physical contact, and how available and how consistently protective equipment is used [4]. Each sport category carries its own mechanism and risk profile, and racquet and ball sports, contact and combat sports, and team sports all injure athletes differently, from recreational leagues through college and professional competition.

A growing body of evidence indicates that most sports-related ocular injuries are preventable with eyewear that meets recognized safety standards, which has prompted international sports medicine organizations to call for more standardized prevention approaches within elite sport [5,6,7].

Despite this evidence, awareness of eye-injury risk and eyewear use vary widely across athletic populations [8]. The gap between eyewear's demonstrated efficacy and its real-world uptake has proven persistent.

This review aims to synthesize current evidence on the incidence, mechanisms, prevention strategies, and awareness of sports-related ocular injuries, focusing on how effective protective eyewear is and how widely it is adopted across levels of competition. Specifically, it looks at the reported incidence and distribution of ocular injuries across sports, the mechanisms and sport-specific risk factors behind this trauma, how well protective eyewear prevents or limits injury severity, and how aware athletes are of the risk and how often they actually wear eyewear. Eyewear regulation, promotion, and availability vary substantially between sports, so awareness and use would be expected to vary too, a pattern this review returns to throughout.

2. Research materials and methods

The literature search was carried out in PubMed, covering publications from 2017 to 2026, with a small number of older foundational sources included where they remain the primary reference on a topic. As is typical for a narrative review, no protocol was registered and no systematic study-selection flow diagram was produced. Search terms combined ("ocular injury" OR "eye injury" OR "ocular trauma") with (sport* OR athlete*) and ("injury prevention" OR "protective eyewear"). Thirty sources met the criteria: peer-reviewed empirical studies, systematic and narrative reviews, case reports, and one international expert consensus statement, spanning recreational through professional levels of competition. Excluded were case reports without epidemiological or clinical relevance, non-English-language sources without an available translation, and articles on non-sport-related ocular trauma. Results were not pooled quantitatively; instead, sources were screened for relevance and grouped thematically into five areas, incidence and epidemiology, injury mechanisms and high-risk sports, eyewear types and efficacy, awareness and use among athletes, and prevention

strategies and policy, and findings were synthesized to draw out where the literature agrees and where it does not.

3. Results

3.1. Incidence and Epidemiology of Sports-Related Ocular Injuries.

Sports-related ocular trauma accounts for more than 40,000 emergency department visits annually in the United States alone, a meaningful share of all eye trauma seen in emergency and ophthalmic care [2]. Blunt trauma recurs as a cause of vision-threatening presentations across age groups, and a subset of these injuries are open-globe, carrying a substantially worse visual prognosis and requiring specialized surgical management [1]. Registry and hospital-based data from several countries help put a number on this burden. In South Korea, 349 sports- and recreation-related eye injuries were recorded over two years, with soccer the leading cause at 21.8% [9]. The multicenter China Ocular Trauma Study (COTS) found that sports-related injuries made up 3.60% of all hospitalized ocular trauma nationally, with youth aged 10–20 years accounting for over a third of cases [10]. At a United States tertiary eye center, sports-related injuries made up roughly 20% of youth eye-injury presentations over a five-year period, with hyphema the most common diagnosis [11]. An Australian series of 1,793 sports-related presentations identified soccer, Australian rules football, and basketball as the leading causes, with projectile impact the dominant mechanism [12]. A separate 10-year United States analysis of 1,290 pediatric cases pointed to baseball, basketball, and soccer as the most common causes, with orbital fracture the leading diagnosis among cases requiring surgery [13].

Incidence patterns shift as sports rise and fall in popularity. In the United States, tennis-related ocular trauma has been estimated at roughly 800 eye injuries a year [14]. In Jönköping County, Sweden, floorball accounted for the largest share of sports-related eye injuries at 39%, with padel close behind at 20%, though padel's share climbed fast enough to become the leading cause by 2021 [15]. A national United States analysis found pickleball-related ocular injuries rose by roughly 1,810% between 2021 and 2023, hitting older adults disproportionately [16]. A badminton case series of 85 ocular trauma presentations flagged doubles play as a particular setting of concern, given how close partners stand and how fast the shuttlecock moves [17].

Elite and professional sport show that ocular and periorbital injury is not confined to recreational or youth participation. Across five National Basketball Association seasons, the eye was the single most commonly injured facial location, making up 37.0% of all recorded facial injuries [18]. In professional mixed martial arts, 73.3% of events included at least one eye injury, most often eyebrow and eyelid lacerations [19]. Taken together, these figures point to sports-related ocular injury as a consistent phenomenon across populations, one that touches

recreational, youth, collegiate, and professional athletes alike even as its incidence and character shift by sport, age group, geography, and level of play.

3.2. Mechanisms of Injury and High-Risk Sports.

Under standardized ocular trauma terminology, sports-related injury is broadly classified as blunt (closed-globe) or penetrating (open-globe), with blunt trauma from a ball, racquet, or piece of equipment the dominant mechanism in most sports [1,2]. Injury type depends heavily on the size, mass, and velocity of the impacting object: smaller, denser, high-velocity objects such as golf balls and paintballs more often cause globe rupture, while larger balls tend to produce contusive trauma and globe distortion without rupture. This compressive force follows a coup–contrecoup pattern, where anterior chamber compression followed by equatorial expansion of the globe can produce choroidal rupture, macular hole, retinal tear, or vitreous hemorrhage [2]. High-velocity projectiles are a consistent hazard in racquet and ball sports specifically, where the ball or shuttlecock is typically the direct cause of injury, as seen in soccer, badminton, and padel [5,15,17].

Contact and combat sports look different: direct blows, not projectile impact, dominate the mechanism profile. Periocular lacerations are the most frequently reported injury in both boxing and mixed martial arts, though eye trauma makes up a much larger share of overall injuries in boxing [19,20]. Mixed martial arts carries its own particular risk, since the frequency and variety of strikes to the head, combined with bare fingers and glove design, raise the chance of both blunt impact and inadvertent eye pokes. Fighters who sustain an eye injury during a bout are disproportionately likely to lose that bout, and typically need several weeks away from contact before returning to competition [19].

Team and stick sports add their own mechanism-specific risks. In floorball, eye injuries have outnumbered those from all other sports combined, often occurring without any protective eyewear [21]. Soccer trauma has been linked to concurrent maxillofacial fracture from direct ball or head contact [22], and in ice hockey, eye and orbital injury remains a recognized risk despite widespread visor use, a reminder that partial facial protection does not eliminate mechanism-specific risk entirely [23]. Less typical but clinically significant mechanisms turn up outside formal competition too: recoil injury from elastic resistance-training bands has produced sight-threatening posterior segment trauma in vitreoretinal case series [24], and isolated case reports describe choroidal rupture, complex globe injury, and orbital fracture among athletes in football, soccer, and professional competition more broadly [25,26,27].

3.3. Protective Eyewear: Types and Efficacy.

Protective eyewear that complies with recognized standards, such as ASTM F803, is consistently associated with lower ocular injury risk, while non-compliant alternatives like ordinary prescription eyewear or sunglasses can themselves contribute to injury on impact [2]. Biomechanical modeling of soccer ball impact puts a number on that protective effect: polycarbonate eyewear reduced peak retinal stress and strain by roughly 60–70% compared with an unprotected eye, and acrylic eyewear provided a smaller but still substantial reduction [5].

A systematic review of eyewear effectiveness across squash, racquetball, tennis, and badminton, screening 364 studies down to 29 that met inclusion criteria, reached a similar conclusion: appropriate eyewear reduces both the incidence and severity of eye injury in racket sports. That matters given estimates that racket sports alone account for roughly a quarter to half of all sports-related eye injuries [6].

Real-world adoption of certified protective eyewear lags well behind this evidence, and even self-reported use often means inadequate protection rather than none at all. In floorball, only one of 98 injured patients had been wearing eyewear at the time of injury [21]. A survey of pickleball players found that just 20% of professionals and 45% of amateurs reported wearing any eyewear, and most amateurs who did wore ordinary prescription glasses rather than dedicated protective eyewear [28]. Combining education with mandatory protective equipment has produced substantial reductions in ocular injury, exceeding 70% in some settings and approaching full prevention where eyewear use is compulsory [29]. A case-level example points the same direction: a custom-fitted face guard made for a futsal player after an initial ocular injury successfully prevented further eye contact during subsequent play [30].

3.4. Awareness, Attitudes, and Use Among Athletes.

Even with consistent evidence that protective eyewear reduces injury risk, athletes' awareness of that risk stays limited and often does not match where the actual harm comes from. In a survey of United States youth aged 14–24, only 18.1% expressed concern about eye injury from sports or physical activity, versus 43.8% worried about excessive screen use and 37.6% worried about sunlight or UV exposure, even though sports and recreation is a leading cause of eye injury in this age group [8].

That gap shows up directly in low real-world eyewear use. A survey of professional and amateur pickleball players found only 20% of professionals and 45% of amateurs reported wearing protective eyewear, with use notably higher among advanced amateurs than beginners. Discomfort, including fogging and sweat, low perceived risk, and limited awareness of what

eyewear options exist were the reasons most often cited for skipping it [28]. Floorball shows a similarly low compliance rate, with only a small minority of injured players wearing eyewear at the time of injury [21], which suggests this gap between efficacy and use is not confined to one sport.

Low awareness and inconsistent eyewear use, then, do not stem from a lack of evidence. They reflect gaps in risk perception, comfort with the eyewear designs currently available, and limited exposure to targeted education, each a workable target for future prevention efforts.

Table 1. Reported incidence, injury mechanism, and protective eyewear use by sport.

Sport	Reported Incidence	Main Mechanism	Eyewear Use (%)	Source
Badminton	85 cases (single-center case series)	Shuttlecock impact, doubles play	Not reported	[17]
Padel	20% of cases in a 255-patient regional cohort; leading cause by 2021	Ball impact	Not reported	[15]
Floorball	Largest single cause in a 255-patient regional cohort (39%)	Ball impact	~1% (1 of 98 injured players)	[15,21]
Pickleball	~1,810% rise in cases, 2021–2023 (US)	Ball/paddle impact	20% (professionals); 45% (amateurs)	[16,28]
Tennis	~800 eye injuries/year (US)	Ball impact	Not reported	[14]
Ice hockey (NHL)	31 eye injuries over 8 seasons (2010–2018)	Stick/puck or blunt contact	75.2% (visor use, non-rookies, post-policy)	[23]
Mixed martial arts (professional)	73.3% of events included ≥ 1 eye injury	Direct blows, eye pokes	Not applicable (no standard eyewear)	[19]
Basketball (NBA)	Eye = 37.0% of all recorded facial injuries	Incidental contact	Not applicable (no standard eyewear)	[18]

Note. Figures are drawn from the individual studies cited in Sections 3.1–3.5; reporting methods, study periods, and populations differ across sources and are not directly comparable.

"Not reported" indicates the source study did not report an eyewear-use figure; "Not applicable" indicates the sport has no standard protective eyewear.

3.5. Prevention Strategies and Policy.

Policy mandates requiring protective eyewear have measurably cut ocular injury at the professional level. After the National Hockey League introduced its visor policy in the 2013–2014 season, visor use climbed from as low as 15% in the late 1990s to over 75% among non-rookie players, alongside a significant drop in yearly eye injuries, missed games, and associated financial losses versus pre-policy baselines [23]. A prospective study at a military hospital in India found much the same pattern: combining mandatory ocular protective gear with structured health education for players, parents, and coaches cut sports-related ocular injuries by more than 70% over five years [29].

On the strength of this evidence, systematic reviews and international consensus statements have called for broader, more standardized eyewear policy. One systematic review of eyewear effectiveness in racket sports argued that national governing bodies should consider extending or introducing formal eyewear requirements, given how consistent the evidence base is [6]; an international consensus statement on ophthalmology in elite sport made a similar call for greater standardization of ocular injury prevention across disciplines [7]. A narrative review focused specifically on team sports reached a similar conclusion, reporting that comprehensive prevention strategies combining protective eyewear with educational programs could reduce the incidence and severity of eye injuries by as much as 70–100% [31].

Blanket policy mandates are not the only tool, though. Individualized prevention has a role where standard equipment does not fit or protect a given athlete well: a custom-fitted face guard made for a futsal player after an initial ocular injury successfully prevented further eye contact in subsequent play, a small but telling example of what tailored solutions can offer when off-the-shelf eyewear falls short [30]. Put together, the evidence points toward a combined strategy, mandatory eyewear policy, targeted education, and individualized equipment where necessary, as the most effective way to reduce the ongoing burden of sports-related ocular injury.

Table 2. Prevention interventions and their reported effectiveness.

Intervention Type	Sport / Context	Reported Effect	Source
No intervention (voluntary eyewear use)	Floorball	Only 1 of 98 injured players wearing eyewear at time of injury	[21]
Eyewear meeting recognized safety standards (no mandate)	Racket sports (squash, racquetball, tennis, badminton)	Reduced incidence and severity of eye injury across included studies	[6]
Individualized/custom equipment	Futsal (case-level)	Custom-fitted face guard prevented further eye injury after an initial trauma	[30]
Policy-level eyewear mandate	Ice hockey (NHL)	Visor use rose from 15% to over 75%; significant reduction in yearly eye injuries, missed games, and financial losses	[23]
Combined mandate + structured education	Multi-sport (military hospital cohort, India)	More than 70% reduction in ocular injuries over a 5-year period	[29]

Note. Rows are ordered from no intervention through single-component approaches to combined strategies, illustrating the general pattern that combined interventions are associated with the largest reported reductions in injury. Effect estimates are drawn from studies with differing designs, sports, and populations and should not be directly compared as if from a single trial.

4. Discussion

Sports-related ocular trauma represents a substantial public-health burden, accounting for tens of thousands of emergency department visits annually in the United States alone, with blunt impact from balls, racquets, or direct contact the predominant mechanism across competition levels and disciplines [2]. Protective eyewear meeting recognized standards is consistently associated with reduced injury risk [6], and in settings where its use has been mandated at the policy level, the resulting reductions in incidence appear more likely causal than correlational [29].

Interpretation of these findings is bounded by the evidence available. Incidence estimates derive from a mix of hospital-based case series and national surveillance databases and are therefore best compared within, rather than across, data sources (Table 1). Awareness and attitudes data remain concentrated in a small number of sports, chiefly pickleball, and in youth populations, leaving most other disciplines uncharacterized [28]. Because most interventions combine education with equipment mandates, the two cannot be reliably disentangled: the combined approach is effective, but each component's independent contribution is undetermined.

These distinctions carry practical weight. Organized elite sport can mandate and enforce eyewear policy; recreational, amateur, and youth sport generally cannot, and these populations report both lower risk awareness and lower eyewear use. Even under medical oversight, as in professional mixed martial arts, ocular injury carries real competitive cost — affected fighters are disproportionately likely to lose the bout in which the injury occurred and typically miss weeks of competition — so prevention holds value beyond long-term vision alone. Closing the gap for recreational and youth athletes likely requires educational strategies delivered through parents, schools, and community sport organizations, since policy mandates alone reach only organized elite sport.

As a narrative, non-systematic review based on a single-database search without formal quality weighting, this synthesis draws on evidence of varying methodological rigor. Findings should be interpreted accordingly.

5. Conclusions

Sports-related ocular trauma is a substantial, largely preventable public-health burden: tens of thousands of emergency department visits annually in the United States alone, across every level of competition and a wide range of disciplines. Eyewear meeting recognized safety standards consistently reduces both the incidence and severity of these injuries, and pairing eyewear mandates with structured education has produced substantial reductions in real-world settings. Even so, awareness of injury risk and use of protective eyewear remain low and inconsistent, particularly among recreational, amateur, and youth athletes, who lack the organizational infrastructure that professional and elite sport can rely on. Closing this gap will likely take a combined strategy: targeted education, broader eyewear promotion, and, where feasible, policy measures extended beyond elite competition.

Disclosure

All authors have read and agreed to the published version of the manuscript.

Author Contributions

Conceptualization: Martyna Czmiel, Weronika Ścieglińska, Antonina Radolinska, Bogumiła Szarek, Rafał Szarek, Monika Chlipała, Jakub Andrzejewicz

Methodology: Martyna Czmiel, Antonina Radolinska

Software: Weronika Ścieglińska, Monika Chlipała

Formal analysis: Bogumiła Szarek, Rafał Szarek, Jakub Andrzejewicz, Martyna Czmiel

Investigation: Antonina Radolinska, Monika Chlipała, Jakub Andrzejewicz, Rafał Szarek

Resources: Bogumiła Szarek, Rafał Szarek, Antonina Radolinska

Data curation: Weronika Ścieglińska, Jakub Andrzejewicz

Writing – rough preparation: Martyna Czmiel, Monika Chlipała, Weronika Ścieglińska

Writing – review and editing: Antonina Radolinska, Monika Chlipała, Jakub Andrzejewicz, Weronika Ścieglińska

Visualization: Bogumiła Szarek, Rafał Szarek

Supervision: Weronika Ścieglińska, Antonina Radolinska, Bogumiła Szarek, Martyna Czmiel

Project administration: Martyna Czmiel

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Conflicts of Interest

The authors declare no conflict of interest.

Declaration of Artificial Intelligence Use

Artificial intelligence-assisted tools were used solely for language editing and refinement of the manuscript's academic English, ensuring clarity and adherence to scientific writing standards; all literature selection, interpretation, and conclusions were performed and verified by the authors.

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