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Refractive Correction in Athletes: From Spectacles and Contact Lenses to Refractive Surgery - Performance, Safety and Return-to-Sport Implications. A Narrative Review

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Abstract

Background: Vision supports sporting performance, but refractive correction requires consideration of ocular safety.

Aim: To review correction methods in athletes in relation to performance, safety and return to sport.

Material and methods: This narrative review considered the Scale for the Assessment of Narrative Review Articles (SANRA) criteria. PubMed, ScienceDirect, SpringerLink and the Quality in Sport archive were searched in October 2026 for English- or Polish-language publications from 2005-2026. Twenty-seven publications were synthesised narratively.

Results: Contact lenses predominated during sport, while many spectacle wearers participated without correction. Performance effects depended on the task and impairment pattern. Standards-compliant protective eyewear reduced injury frequency and severity. Water exposure during lens wear increased Acanthamoeba keratitis risk; water sports were associated with non-infectious keratitis in orthokeratology users. Refractive surgery yielded favourable visual outcomes, but LASIK flaps remained vulnerable to late trauma. Safe return-to-sport intervals were not established.

Conclusions: Correction should reflect age, sporting demands, trauma risk and water exposure. Prescription protective eyewear is recommended in high-risk sports; surface ablation merits consideration when surgery is chosen. Pre-participation ophthalmic assessment, lens hygiene education and research on postoperative return to sport are needed.

Key words: Athletes; Refractive Errors; Eyeglasses; Contact Lenses; Refractive Surgical Procedures; Athletic Performance; Eye Protective Devices; Return to Sport.

1. Introduction

Visual abilities are essential to sporting performance, as vision provides much of the perceptual information that guides an athlete's motor responses [1,2]. The athlete's eye contributes to performance while remaining vulnerable to injury.

Myopia is becoming increasingly common worldwide, with its prevalence projected to reach approximately 50% of the global population by 2050 [3]. This trend suggests that more athletes will require refractive correction. Available options include spectacles, including prescription protective eyewear, contact lenses, orthokeratology and refractive surgery. The choice depends on comfort, sporting discipline, age and level of participation [1,4]. Each method has its own limitations and risks: contact lenses offer no protection against ocular trauma, while refractive surgery may be associated with postoperative dry eye [2].

The literature provides no clear criteria for determining when athletes should use refractive correction [5]. Available evidence is fragmented, with studies often focusing on small subgroups or isolated variables, while findings from static tasks may not translate directly to dynamic competition [6,7]. These limitations highlight the need to consider correction choices alongside sporting performance, safety and return to sport. This narrative review examines spectacles and protective eyewear, contact lenses, orthokeratology and refractive surgery in relation to these three outcomes and aims to provide practical guidance for athletes, coaches and physicians.

2. Research materials and methods

This study is a narrative review prepared with consideration of the criteria of the Scale for the Assessment of Narrative Review Articles (SANRA) [8]. The literature search was conducted in October 2026 using PubMed, ScienceDirect, SpringerLink, and the Quality in Sport archive. The search strategy combined two groups of terms: those related to refractive correction and visual function (“spectacles”, “eyeglasses”, “prescription eyewear”, “contact lenses”, “orthokeratology”, “refractive surgery”, “LASIK”, “refractive surgical procedures”, “refractive error”, “visual performance”, “visual acuity”, “protective eyewear”, “eye protective devices”) and sport (“sport”, “athletes”, “athletic performance”, “sports vision”). These terms were combined using Boolean operators, and the strategy was adapted to each platform. Eligible publications were published between 2005 and 2026, written in English or Polish, concerned human participants and had full text available. The literature included original studies (experimental, cohort, cross-sectional and case series), consensus reports and reviews concerning refractive correction in athletes or physically active individuals. Publications outside the scope of the review were excluded. Records were initially screened by titles and abstracts and then exported to Zotero. After duplicate removal, 133 publications remained for full-text assessment. Following full-text assessment against the eligibility criteria, 25 publications were included in the review. Reference lists of included articles were additionally screened to identify relevant sources (n=2). Data from the included publications were compiled in an extraction table and synthesised narratively by theme, corresponding to sections 3-5.

3. Research results

3.1 Refractive errors in athletes

Uncorrected refractive error can hinder perception of the surroundings and the processing of visual signals potentially influencing athletes' safety and performance [2,9]. As reported by Łabuś et al., the global prevalence of myopia increased from 28.3% in 2010 to 34.0% in 2020 [3].

In a questionnaire-based study published in 2018, Zeri et al. analysed a subgroup of 1519 individuals engaged in sport who had not undergone refractive surgery. Overall 38.2% of participants reported refractive error. As percentages of this subgroup, 31.2% of participants reported myopia, 15.9% astigmatism, and 4.1% hyperopia. These categories were not mutually exclusive [1]. Another study of 147 professional footballers by Jorge et al. revealed mean refractive error of −0.04 ± 0.83 D with 16.4% myopic and 19.9% hyperopic [5]. The prevalence of myopia in athletes reported by Zeri et al. appears to be similar to that observed in the general European population. However, the authors noted considerable geographical variation, with estimates ranging from 17% to 49% in Western countries and reaching 80% in some Asian populations [1]. Reliable comparisons between studies are complicated by differences in ethnicity, gender, age, environmental factors, and measurement and classification methods [1]. In the study by Zeri et al., gender and location of sport practice were the strongest predictors of myopia prevalence ($p<0.001$) [1]. Participation in outdoor activity was associated with a lower prevalence of myopia [1]. The protective effect may be attributable to time spent outdoors, rather than to physical activity itself [1,3]. As cited by Łabuś et al., an additional 76 minutes outdoors per day above baseline was associated with an approximately 50% reduction in incident myopia [3]. More than three hours of physical activity per week was also associated with an approximately 40% reduction in the odds of myopia [10]. However, it is worth bearing in mind that outdoor sports may be chosen more frequently by non-myopic individuals, which complicates interpretation of this association [1].

A clear majority of athletes with refractive errors use optical correction [1]. However, its use during sport varied by correction method. While 92.5% of contact lens wearers continued to use lenses during sport participation, only 30.3% of spectacle wearers wore their glasses [1]. Contact lenses are the most commonly used method of refractive correction during sport. The proportion of contact lens wearers in the study group was approximately four times that in the general population [1]. Nonetheless, preferences regarding correction methods varied by sport

discipline, age, and the level of involvement. Competitive athletes attached greater importance to vision correction [1]. Among competitive participants in rugby, fighting sports and racquet sports, refractive surgery was the preferred option in the questionnaire [1]. Differences in preferences between levels of participation were less pronounced among adolescents, possibly because of the invasive nature of surgery [1].

According to Jorge et al. study 11% of professional footballers required correction to play, but only one in four of them used it during matches. The choice differed by playing position. While all goalkeepers who required correction according to the study criteria used it, only 16% of forwards employed it. Interestingly, dynamic visual acuity was lowest among forwards and highest among goalkeepers. Furthermore, 3.4% of the footballers had anisometropia, which may impair binocular vision and reduce stereopsis [5]. It has been recommended that footballers have a visual acuity of at least 1.0 (6/6) and binocular emmetropia [6].

Although coaches, physical education teachers and sports physicians consider vision correction important, they were less inclined to recommend contact lenses. The authors suggest that this reluctance may reflect persistent prejudice arising from the scarcity of knowledge. Among sports physicians the gap disappeared after an educational update. The contact lens users themselves were also more likely to recommend them than non-wearers [9]. Due to the potential safety and efficacy problems, the major apprehension regarding contact lens use was related to swimming [9]. There is a need for standardised ophthalmologic examination including visual acuity prior to sport participation [2,11]. Given the prevalence of refractive errors among athletes and their inconsistent use of correction during sport, the question arises as to how this affects sport performance.

3.2 Consequences of uncorrected refractive error for sports performance

Many sporting actions depend on visual information to guide movement, identify relevant targets and coordinate responses. Uncorrected refractive error may therefore interfere with the visual processing required for effective performance [9]. Visual demands also extend beyond static visual acuity to binocular vision, depth perception, peripheral awareness and the processing of multiple moving stimuli [6]. These functions are relevant to both performance and safety, and visual deficits provide a rationale for comprehensive pre-participation assessment [2]. However, the extent to which reduced visual clarity affects performance appears to depend on the task, the severity of impairment and whether one or both eyes are affected [7,12,13].

Bulson et al. investigated basketball free-throw performance in 44 adults aged 18-30 years with varying refractive errors and playing experience. Participants performed free throws under five lens-induced defocus conditions: plano, +1.50 D, +3.00 D, +4.50 D and +10.00 D. Small to moderate amounts of spherical myopic defocus, approximately 1.50-3.00 D, did not significantly impair shooting performance. A significant reduction occurred only at the highest defocus level of +10.00 D. These values describe the experimentally induced optical conditions rather than the participants' habitual refractive errors. The findings suggest substantial resilience to blur, although free throws represent a relatively non-dynamic task performed at a fixed distance [7].

Runswick et al. examined technical and anticipation performance in 19 sighted footballers with amateur, county-level or semi-professional experience. Six levels of visual impairment were simulated using Hampshire Frost filters mounted in safety glasses, reducing both visual acuity and contrast sensitivity. The technical assessment required ball control, dribbling, changes of direction and passing on a futsal court, including a response to a defender. Technical performance deteriorated significantly at simulation levels 4-6, whereas anticipation performance declined only at levels 5 and 6. Thus, technical skills were affected at a less severe level of impairment than anticipation. Visual acuity was also a better predictor of performance than contrast sensitivity, although these task-specific findings do not establish a general threshold for acceptable uncorrected vision [12].

Leivers et al. investigated penalty kicks in two experiments involving binocular impairment in 25 participants and monocular impairment in 28 participants. Examining these conditions separately helps clarify whether a normally functioning fellow eye can compensate when vision in the other eye is reduced, a question relevant to asymmetric visual conditions such as anisometropia. In the binocular-impairment experiment, significantly fewer goals were scored at simulation level 6 than under habitual vision (21 versus 38; $p = 0.005$). Ball velocity was approximately 12% lower at levels 5 and 6, and severe impairment was associated with a more central shooting strategy. These findings indicate that reduced vision can alter both the outcome and execution of a penalty kick. In the monocular-impairment experiment, however, simulation level had no significant effect on the number of goals scored ($p = 0.547$), ball velocity or placement. In the comparison between experiments, relative performance was closer to habitual

performance under monocular impairment than under binocular impairment (97.02% versus 90.98%). This suggests that a normally functioning fellow eye can help preserve performance in this particular task. However, experimentally induced monocular blur does not reproduce all features of chronic conditions such as anisometropia or strabismus, and these findings cannot establish that such conditions have no sporting consequences or be directly generalised to open play [13].

Interpretation is limited by the small samples of 19-44 participants, the use of simulated blur in individuals with good baseline vision, and, in Runswick et al., a study objective focused on classification in parasport rather than evaluating refractive correction in athletes [7,12,13]. Collectively, the findings indicate that the consequences of reduced vision depend on both the sporting task and the pattern of visual impairment [7,13]. Moreover, uncorrected refractive error may predispose athletes to injury, providing a safety rationale for visual assessment and appropriate correction beyond performance alone [2]. The practical question is therefore which correction method-spectacles, contact lenses, orthokeratology or refractive surgery-best meets an athlete's visual needs while maintaining comfort and safety in the relevant sport.

3.3 Vision correction methods

All vision correction methods balance visual quality, comfort and safety differently in sport. The choice of the most suitable method depends on sport discipline, age and level of competition.

3.3.1 Spectacles

Although spectacles are the simplest form of correction, athletes often remove them during physical activity, and only about 30% of spectacle wearers continue wearing them while doing sports [1]. Upon impact, standard prescription eyeglasses can pose a hazard. Lens breakage can cause penetrating wounds, while rigid frames may lead to localised skin lacerations and fractures, further complicating the injury [14,15].

Sports-related eye injuries are a significant problem. In the study by Leivo et al., approximately one in eight eye injuries was sports-related (149 of 1151 patients). Floorball accounted for the largest number of sports-related injuries (32%), followed by football, tennis, and ice hockey. A majority of injuries were caused by sports equipment (79%). Only 5% of patients with sport-

related eye injuries had used protective eyewear [16]. As reported in the review covering eye injuries in racket sports, the median proportion of injuries occurring without eye protection was 93% [14]. Evidence indicates that in racket sports, protective eyewear meeting standards, such as ASTM or equivalent, reduces the frequency and severity of injuries. Several studies included in the review recommend polycarbonate lenses with a minimum thickness of 3 mm. Lensless eye guards are insufficient, because the ball deforms on impact and can pass through the opening to reach the eye; industrial eyewear is also insufficient [14]. The requirement to wear eye protection has been associated with substantial reductions in the number and severity of injuries, with reported reductions of 70-100%, but its effectiveness depends on players' compliance [11]. A visor offers protection only when properly fitted, covering the eyes and the lower edge of the nose in all projections [16]. In the study by Leivo et al., 4 of the 12 ice hockey injuries occurred despite the use of a visor [16].

Protective eyewear can also incorporate prescription lenses, combining refractive correction with eye protection. In rugby, special goggles that can accommodate prescription inserts were incorporated into the Laws of the Game in 2019 [17]. A survey conducted by Little et al. revealed that 91% of goggle users reported that the goggles enabled them to play rugby, when their visual impairment would otherwise have prevented participation. In addition, 70% reported using the goggles because they needed spectacles or contact lenses in everyday life [17]. However, using goggles also entails certain drawbacks. Respondents expressed dissatisfaction with fogging (49.7%), suitability for all weather conditions (34.7%), and the goggles getting dirty (32.6%). Shifting during play (23%) and limited field of view for some users were also reported [17]. It is therefore worth emphasising the role of educating players, coaches and parents to increase acceptance of protective equipment [11].

3.3.2 Contact lenses

Contact lenses are the most popular method of vision correction among athletes [1]. They offer a range of advantages, such as a wider field of view when looking upwards, fewer reflections, and greater comfort compared to glasses [4]. For sports requiring rapid eye movements, larger-diameter lenses are recommended because they remain more stable and are less likely to be dislodged. Rigid lenses often have a smaller diameter and lower ocular conformance, making them prone to being lost [4]. However, in target sports such as shooting, where competitors blink less frequently, some prefer glasses, as contact lenses can shift and dry out [4]. Tinted

sport lenses are also available. Amber lenses are used for dynamic sports, while grey-green lenses are intended to enhance the visibility of environmental details in water-surface sports such as kayaking or surfing [4]. Although tinted lenses may improve vision, they can also impair it depending on the environmental conditions, visual status and spectral transmission properties of the filter [4].

Notably, contact lenses do not provide adequate eye protection against injury in sport [2,14]. Despite their convenience, wearing contact lenses also carries risks. The most serious of these is microbial keratitis, the risk of which increases with poor hygiene, sleeping in lenses, and exposing them to water [2,4]. In a case-control study of reusable soft contact lenses, wearing lenses in a swimming pool or hot tub was associated with higher odds of Acanthamoeba keratitis (OR = 3.49) [18]. As cited by Jones et al., amoebae were detected in 41% of examined swimming pool water samples [4]. Furthermore, after swimming in a chlorinated pool, soft lenses may also accumulate bacteria, chiefly Staphylococcus epidermidis [4].

Bacterial contamination of lenses can be reduced by wearing goggles when swimming [4]. According to Carnt et al., an estimated 80-90% of Acanthamoeba keratitis cases are potentially avoidable through effective disinfection, good hygiene and avoiding contact between lenses and water [18]. Daily disposable lenses are associated with fewer inflammatory complications; although microbial keratitis occurs at a similar rate with daily disposable and reusable lenses, cases tend to be less severe and have better visual outcomes [4].

3.3.3 Orthokeratology

Orthokeratology allows athletes to participate in daytime sports without spectacles or contact lenses by wearing rigid contact lenses overnight. In a retrospective study of 600 orthokeratology patients, whose mean age was 13.2 years, no cases of infectious keratitis were observed during a mean follow-up of 4.2 years. However, non-infectious infiltrative keratitis developed in 121 patients, with 62% of cases occurring within the first year and 80% within the first two years of lens wear. Participation in water sports, defined as competitive swimming or water polo at least three times a week, was associated with higher odds of infiltrative keratitis (OR = 3.79) [19]. The young age of the study population limits the applicability of these findings to adult athletes. The TFOS report cited estimates of microbial keratitis incidence in children wearing orthokeratology lenses between 4.9 and 13.9 cases per 10,000 patient-years. The higher

estimate was comparable to that reported in adults wearing soft contact lenses overnight [4]. Based on their findings, Tapasztó et al. recommended corneal examinations at intervals shorter than six months, with more frequent follow-up, ideally every three months, when risk factors such as participation in water sports are present [19].

3.3.4 Refractive surgery

Refractive surgery can reduce dependence on spectacles and contact lenses, offering a practical benefit for athletes. It also carries risks, including dry eye, which may be accompanied by persistent severe symptoms or neuropathic pain that is difficult to relieve [20]. In a military population undergoing photorefractive keratectomy (PRK), laser-assisted in situ keratomileusis (LASIK) or laser epithelial keratomileusis (LASEK), 85.6% of eyes with at least three months of follow-up achieved uncorrected visual acuity of 20/20 or better. The study included 32,068 treated eyes, of which 8,528 underwent LASIK. Postoperative outcomes did not differ significantly between the three treatment groups, and each reported postoperative complication occurred at a frequency below 1%. LASIK provides faster visual recovery and less postoperative discomfort than PRK, but late traumatic flap dislocation remains a concern for physically active individuals exposed to ocular trauma. In the same military series, late traumatic flap dislocation was reported in 10 eyes of eight patients, with causes including basketball and flag football [21].

A multicentre retrospective study conducted in 31 military hospitals in China identified 45 cases of traumatic flap complications after LASIK. Blunt trauma, including blows from a fist, foot or ball, was the most common cause of injury (75.6%), while flap dislocation was the most frequent complication (71.1%). The absence of scar formation at the lamellar interface leaves the flap vulnerable to displacement years after surgery, with traumatic complications reported up to six years after LASIK. Visual outcomes following treatment were generally favourable: 91.1% of cases had visual acuity of 20/40 or better at discharge. Poorer outcomes were associated with severe trauma, additional ocular injuries and delayed treatment. The authors therefore suggested that surface ablation may be a better option for individuals particularly vulnerable to eye injuries, such as military personnel [22]. Early recovery after small-incision lenticule extraction (SMILE) and femtosecond laser-assisted LASIK (FS-LASIK) was compared by Liu et al. in 30 patients (60 eyes) per group, with follow-up limited to 24 hours. Visual recovery was slower after SMILE at two and four hours, while subjective discomfort

was greater after FS-LASIK [23]. Although the authors described satisfactory recovery in both groups at 24 hours, the small sample and short follow-up limit conclusions about later outcomes and do not establish when an athlete can safely return to sport.

3.4 Return to sport after refractive surgery

Evidence of an effect on sporting performance remains limited. A study of only 12 professional baseball players found no statistically significant difference in offensive performance before and after laser refractive surgery, despite the elimination of spectacles or contact lens wear; the small sample and sport specific outcomes limit generalisation to other sports. All players reported satisfaction with the procedure, and none regretted their decision [24]. In the military study, all treated soldiers were considered fit to return to duty, although most did not deploy during the first three postoperative months [21]. Among Israeli recruits, the dropout rate from combat training was lower in those who had undergone refractive surgery than in recruits with ametropia who had not undergone surgery (1.68% vs. 6.15%). The authors noted that greater motivation among recruits choosing surgery to qualify for combat units could explain this association [25]. These military findings provide context for return to demanding physical activity, but do not establish return-to-sport intervals. For athletes, exposure to ocular trauma is therefore a relevant consideration when choosing a procedure, alongside visual recovery and postoperative symptoms.

4. Discussion

Refractive errors are increasingly common in the general population, yet some athletes participate in sport without correction, particularly spectacle wearers [1,3]. Uncorrected errors may affect performance, although the extent of this effect depends on their type and magnitude, the sporting discipline and the visual demands of the task [7].

No single method of refractive correction is optimal for all athletes. Each offers a different balance of comfort, safety and visual quality, and the relative importance of these factors varies across sports [1,4]. Although athletes generally favour contact lenses, some participants in shooting sports prefer spectacles because prolonged intervals between blinks during aiming can cause lens drying and movement, leading to fluctuations in vision [4]. Age also warrants

consideration when selecting a correction method [1]. A retrospective review of the records of 963 children who began wearing soft contact lenses at 8-12 years of age reported rates of microbial keratitis and other inflammatory adverse events comparable to established rates among adults [26].

Conventional spectacles correct refractive errors but do not provide adequate protection against sports-related ocular trauma. Standards-compliant protective eyewear incorporating refractive correction is therefore recommended when eye protection is required [14]. Its effectiveness depends on whether athletes wear it consistently and correctly [11]. Rules governing its use, together with their enforcement, can help improve adherence.

Water sports pose particular challenges for contact lens wearers. Exposure to water while wearing lenses is an established, independent risk factor for Acanthamoeba keratitis [18]. Participation in water sports has also been associated with non-infectious inflammatory corneal complications among orthokeratology users [19]. Nevertheless, swimming in contact lenses remains common, with one study reporting this behaviour in 62% of soft contact lens wearers [27]. Preventive measures include avoiding contact between lenses and water, using swimming goggles, ensuring effective disinfection and maintaining good lens hygiene [4,18].

Refractive surgery can reduce dependence on spectacles and contact lenses during sport. The choice of procedure is important. LASIK provides faster visual recovery and less postoperative discomfort than PRK, but the corneal flap remains vulnerable to traumatic displacement even years after surgery [21,22]. Surface ablation may therefore be a more appropriate option for athletes exposed to ocular trauma, particularly in contact and combat sports. Regardless of the procedure chosen, the risk of postoperative dry eye should also be considered [20].

Education can help address reluctance to recommend contact lenses in sport [9]. Zeri et al. found that coaches, physical education teachers and sports physicians considered refractive correction important but were less likely to recommend contact lenses, a discrepancy the authors attributed to possible prejudice against their use. This difference disappeared among sports physicians following a one-day training programme [9]. Wearers themselves also need practical guidance on safe lens use. Suresh et al. reported that approximately 57% of contact

lens wearers with bacterial keratitis exhibited poor lens wear behaviour or hygiene, highlighting the need for targeted education [28].

Changes in sporting regulations and developments in corrective equipment can make participation easier for people with refractive errors. In a survey of rugby players using prescription-compatible goggles, 91% of respondents reported that the goggles made it possible for them to play, supporting the value of allowing their use in the sport [17]. Larger-diameter contact lenses offer another practical option by improving lens stability during changes in gaze and rapid eye movements [4]. SMILE, a newer refractive surgical technique, was associated with less discomfort than FS-LASIK in an early postoperative comparison, although the study's short follow-up does not establish safety during sporting activity [23].

The studies examining the effects of simulated blur on sporting performance had limitations related to the populations studied and the tasks assessed. Experimental populations did not fully represent athletes with existing refractive errors, while static tasks, such as basketball free throws, may be less sensitive to blur than actions performed during live competition [7,12,13]. These limitations make it difficult to apply the findings to actual play. Military studies provide information on demanding physical activity after refractive surgery, but their findings cannot directly establish safe return-to-sport intervals.

Although the search used predefined terms, eligibility criteria and a two-stage selection process, this narrative review did not include a formal assessment of study quality or a fully systematic review procedure. Selection bias therefore cannot be excluded. Searches of PubMed, ScienceDirect, SpringerLink and the Quality in Sport archive were supplemented by screening reference lists, but relevant studies available through other sources may still have been overlooked. Only publications in English or Polish with available full texts were included. Future research should include athletes with existing refractive errors, assess performance in dynamic, sport-specific tasks and use standardised, reproducible measures of visual function. Studies comparing surgical procedures and directly evaluating the timing and safety of return to sport are also needed.

5. Conclusions

Some athletes with refractive errors, particularly spectacle wearers, participate in sport without correction. The effect of uncorrected errors on performance is task-dependent: static or self-paced tasks may tolerate moderate blur, but these findings cannot be directly extrapolated to dynamic play. The choice of correction should account for age, sporting discipline, level of participation, risk of ocular trauma, exposure to water and individual comfort. Athletes who require refractive correction in sports with a high risk of ocular trauma should use prescription protective eyewear that meets the relevant safety standards. Contact lens wearers should follow appropriate lens care and hygiene practices and avoid exposing their lenses to water.

Refractive surgery offers a long-term alternative to spectacles and contact lenses, although athletes exposed to a high risk of ocular trauma should consider surface ablation when selecting a procedure. Return-to-sport decisions should be individualised, and further research is needed to establish safe intervals after refractive surgery.

Pre-participation assessment should include an ophthalmic examination and a detailed history of previous ocular injuries, refractive status, current correction and use of eye protection. Athletes, coaches and sports physicians should receive education on the available correction options, safe lens use and the importance of eye protection. Establishing normative values for visual parameters using reproducible methods would support the development of standardised protocols for sports vision assessment.

Disclosure

Supplementary Materials

Not applicable.

Author Contributions

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Declaration of the Use of Generative AI and AI-Assisted Technologies in the Writing

Claude (Anthropic; Opus 5.5 model) was used to assist with formulating database queries, organising the manuscript structure, translating some fragments of author-written text from Polish into English, and improving grammar, style and clarity. It is important to emphasise that AI was used strictly as an assistive instrument under human supervision. The manuscript's substantive content was written by the authors, who reviewed and verified all AI-assisted revisions and checked source-based information against the original publications. The authors retained full responsibility for the interpretation of findings, conclusions, and the final manuscript.

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