Remarkable athletic feats often invoke questions from observers about how these achievements are possible. In baseball, softball, and cricket, how does a batter achieve the remarkable temporal and spatial accuracy in their swing necessary to successfully bat the ball, all while under severe timing constraints? How does a soccer player moving at full speed “thread the needle” with a perfectly placed pass between defenders? Sports are necessarily designed to test the limits of human abilities, and given the vital role of vision in sport, it is important to consider how visual abilities enable or constrain sports performance.

The overarching topic in this feature issue is the role of vision in sports performance. This area is clearly of growing interest, with 73% (1985/2713) of the citations returned in PubMed for the search terms “sports” and “vision” occurring since 2010 (on May 1, 2021). As further evidence of the interest and enthusiasm for sports vision, the International Sports Vision Association was formed to advance the field of vision assessment and training for athletes, and the *Journal of Sports and Performance Vision* began publishing research articles on these topics in 2019. Because sports vision encompasses a wide array of subject matters, the sports vision literature is understandably disseminated throughout many diverse journals that may or may not be devoted solely to vision. These journals are centered around topics including vision science, cognition, kinesiology and biomechanics, sports science, neuroscience, learning, and both ocular and systemic clinical issues.

The goal of this feature issue is to bring together studies that cover a variety of topical areas in sports vision. There are articles on vision assessments, vision correction and eye protection, cognitive-perceptual issues, vision training, concussion, and retinal physiology. Key questions for sports vision practitioners that are addressed in this feature issue include the following: what visual or vision-related attributes may underpin success in a particular sport, what cues are used by athletes to compete successfully in their sport, what visual assessments are best to measure an athlete’s current level of development and to estimate his/her future potential, and which training methods and training environments (e.g., virtual or on-field) result in optimal transfer to athletic competitions. In keeping with the global reach of sports, the articles in this feature issue were contributed by authors from Australia, Belgium, Canada, Germany, Hong Kong, Iran, Japan, the Netherlands, Portugal, Spain, Switzerland, Turkey, the United Kingdom, and the United States.

In this feature issue, Erickson’s1 review of visual skills and assessment devices describes the difficult challenge facing practitioners who must determine which of the myriad of visual skills are most important for a particular sport and which assessments are most appropriate to evaluate these skills.2,3 The review by Hodges and colleagues4 in this issue provides a conceptual framework for perceptual-cognitive skills that may aid the sports vision practitioner in determining those abilities to test and train in a particular sport. Hodges and colleagues divide these skills into fundamental skills (static visual acuity, dynamic visual acuity, peripheral vision), low-level visual skills (color perception, contrast sensitivity, stereoaucity and depth perception, motion perception), high-level and attentional skills (visual attention and eye movements), and cognitive skills (memory, situational knowledge, anticipation, decision making, multitasking, inhibition and interference control, cognitive flexibility). Psychophysical studies of perceptual thresholds, studies of the functional limitations of eye movements, and studies of attentional thresholds in the general population and in athletes in particular serve as a basis for hypotheses regarding when and how visual skills could apply to specific sports.

Another area of emphasis addressed in this feature issue is the comparison of visual skills between athletes (and referees) across different levels of expertise and across different ages.5–12 This includes several original investigations comparing differing levels of expertise,5,6,11 as well as a review by Dalton7 that addresses the quiet eye phenomena. This influential concept refers to the “final fixation or tracking gaze prior to the onset of a critical motor action,” which has been shown to correlate with performance and overall expertise in athletes.8 A key thesis underlying these studies of vision in athletic experts is that at least some of the differences found between higher- and lower-achieving individuals may form the basis of training approaches that can promote athletic (or officiating) performance.

There are some major questions in ball-striking sports such as baseball and cricket that are addressed in this feature issue.4,10,13 These questions include what information is used by athletes in determining when and where an approaching object will arrive to produce an appropriate visuomotor response, and how these cues are combined when generating motor responses. Gray’s13 review in this issue discusses model-based control (primarily predictive and based on internal models of trajectory) versus online control (based on unfolding visual information) models. Much like the information gained in comparing expert and less expert or novice athletes, an understanding of how action is controlled may help to guide the development of sports vision training techniques.

Another question that has generated much interest in the sports vision literature is that of coupled versus uncoupled responses.14–16 In an uncoupled response, the observer’s response is not the same as that required in a game. For example, in cricket, a coupled response would involve a batter attempting to strike approaching balls, whereas an uncoupled response might require the batter to verbally assess when or where the pitched ball will arrive. There is a growing literature suggesting that performance as assessed with coupled responses does not necessarily match performance when measured with uncoupled responses. As described by Mann and colleagues16 in this issue, it has been suggested that differences in coupled and uncoupled responses could be explained by the two-visual-systems hypothesis, wherein uncoupled responses require an overreliance on the ventral system, whereas the dorsal system is primarily used in coupled responses. This discussion of coupled
and uncoupled responses raises numerous questions for testing and training sports vision skills. For example, in talent identification, how representative of in-game tasks must the testing be? In addition, in testing and training athletes, how do practitioners reconcile the requirements of representative training paradigms with limitations on both space and time available for training? Finally, is virtual reality sports training representative enough of in-game conditions to lead to transfer of training to the field?23,17

Competitive video game play (electronic sports, or Esports) continues to grow rapidly in popularity, but little is known about the visual function of Esports players. In this feature issue, Fogt and colleagues18 looked at visual attributes in amateur video game players such as visual acuity, refractive error, accommodative lag, stereacuity, and tear break-up time. They found that all these attributes except tear break-up time were similar to those reported in published population studies. Future studies comparing amateur video game players and professional Esports players would be a next logical step, allowing for a complete profile of visual skills essential for success in the Esports arena.

Another area of interest in sports vision that is the subject of several articles in this feature issue is the influence of visual impairment on sports performance and the related topic of Paralympic classification. In their review, Chun and colleagues19 describe the evolving science of Paralympic sport classification. In this area, work is underway to define how vision influences performance and to appropriately categorize visually impaired athletes to ensure fair competition.19–21 This topic of vision and visual impairments in sports is also central to other articles in this issue that address concussion and eye movements,22 visors for football helmets,23 and the retinal physiology of athletes.24

Ultimately, the goals of sports vision are to determine the best ways to assess vision in athletes and to develop optimal techniques to train vision to improve athletic performance.9,25 Because sports provide robust metrics of performance and because the objective is to achieve better game performance, there has been a strong desire to link vision assessment and/or vision training to quantitative measures of sports performance. In this issue, Laby and Appelbaum9 provide a review of the 13 published articles that have addressed correlations between visual assessments and game statistics and 16 articles that addressed gains due to vision training using benchmarks from in-game statistical production. From this review, the authors conclude that, although some studies reported positive findings and others did not, the field will be best advanced by adopting best practices as used in clinical trial designs, including pre-registration of experimental protocols, power analysis to determine sample size, and the inclusion of a matched control group. Through these approaches, sports vision research will offer greater rigor and increased impact toward improving athletic performance.

In closing, we want to acknowledge the indispensable contributions of the many individuals who reviewed the articles submitted for the feature issue. We believe that this issue provides what we hoped for: sufficient breadth and depth of materials for everyone involved in sports vision to find something of interest and discussions of the many opportunities available for new studies of sports vision that will hopefully lead to on-field improvements in performance. There is clearly much exciting work still to be done in sports vision. Because this area encompasses so many scientific disciplines, there are numerous possibilities for collaboration to advance the field. We hope you enjoy this feature issue as much as we enjoyed putting it together.

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