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As winter draws near and COVID restrictions are set to ease, our thoughts turn to the resurgence of team sports. While the idea of maximising player vision potential has become widely accepted in the premier leagues of sports like cricket, tennis, rugby and soccer many people still wonder if the referees can see as well as they ought. In this issue of Primary Eyecare we take a brief look at some research into player vision and also review referee on-task performance related to measures of visual skill and visual perception.

Differences in visio-spatial expertise between 1 st division rugby players and non-athletes
(Millard et al, 2021)

This study compared the visual expertise of 40 non-athletes aged 19-35 years (average 22 years) to 40 amateur, non-professional rugby players in the first-division of club rugby in the South-African Rugby Union (SARU). The first-division club rugby players, also in the 19-35 years age range (average 24 years), had been in training for a mean time of 9 years. The researchers note that previous studies suggest that athletes have enhanced visio-spatial expertise in comparison to non-athletes but that conflicting research suggests that in some cases athletes and non-athletes possess similar visio-spatial expertise in some visual skills.

To investigate this apparent contradiction Shaw and colleagues first had all participants undergo an optometric assessment and then measurements of 6 visio-spatial intelligence components (VSI) were made:

accommodation facility,
saccadic eye movement,
speed of recognition,
peripheral awareness,
visual memory,
hand-eye coordination.

Results showed that first-division rugby players performed significantly better ($p \leq 0.05$) in five of the six tests performed, except for visual memory ($p = 0.893$).

This study substantiates the notion that athletes perform better on most components of visio-spatial intelligence but there are limits to generalising from first division rugby players to all athletes in all sports.

Shaw et al. make the point that to more accurately distinguish between athletes and non-athletes, research should move away from tests that focus on basic visual function and develop sport specific testing methods that can be used by a variety of sports, it would also be interesting to see studies that investigate different visual skill sets that enable high level performance in different sports.

REFERENCE: (Millard L., Shaw I., Breukelman G., & Shaw B. – Helion; 2021 Feb 16;7(2):e06290. Doi: 0.1016/j.heliyon.2021.e06290.)

Association between Clinical Vision Measures and Visual Perception and Soccer Referees' On-field Performance
(Baptista, et al., 2021)

Just as player visual skills are important to the game, the decisions taken by soccer officials are critically important to game management.

Antonio Baptista and his team proposed that performance on generic tests of vision and visual perception predicts domain-specific performance in elite-level soccer referees and assistant referees .

In order to test the hypothesis the team assessed a suite of vision skills of referees and assistant referees who officiated at the highest level in Portugal. To be eligible for inclusion, the referees and assistant referees must have officiated for at least two consecutive seasons across the 2014/2015, 2015/2016 and 2016/2017 seasons.

Using the Portuguese Soccer Federation rank-order list of match officials for each of these seasons the researchers created a single, rank-order list of the performance of eligible officials. A total of 59 officials from this list participated in the study, 21 referees and 38 assistant referees; 17 participants officiated at the international level.

Clinical vision assessments were made of visual acuity and stereoacuity, measures of visual perception were made using the Test of Visual Perceptual Skills (3rd Edition) and assessments of visual memory were also recorded.

The results showed that while there was no difference in measures of vision and visual perception between the referee group and the assistant referee group better stereoacuity ($P < .001$) and visual memory ($P = .001$) were associated with a higher rank order of on-field performance after adjusting for the age, experience, the national/international status, and the regional affiliation of the officials. Interestingly, these two measures explained 22% of the variance in rank-order performance.

[Image credit: Shutterstock]

Baptista and colleagues note that theirs is the first study to show a link between the vision of match officials and their on-field performance and caution that further work is required to establish whether these particular vision attributes are component skills in the domain of soccer refereeing.

REFERENCE: Association between Clinical Vision Measures and Visual Perception and Soccer Referees' On-field Performance. Baptista A., Serra P., Faisal M., Barrett B. Optom Vis Sci . 2021 Jul 1;98(7):789-801. doi: 10.1097/OPX.0000000000001722.

Comparison of Visual Search Behavior and Decision -making Accuracy in Expert and Novice Fencing Referees (Aghakhanpour et al. 2021)

This study compared visual search behaviour and decision-making accuracy of expert and novice fencing referees to better understand gaze behaviour in relation to referee performance.

Aghakhanpour and colleagues enrolled 28 fencing referees who were divided into expert (n = 14) and novice (n = 14) groups. Participants were fitted with mobile eye trackers and participated in tests that consisted of five blocks of 10 video clips selected from those provided annually by the World Fencing Federation for referee testing.

The results showed the two groups differed significantly in the accuracy of decision making, and the number, duration, and location of gaze fixations.

[Image credit: Shutterstock]

Expert referees had higher decision-making accuracy compared with novice referees; they also had fewer fixations than did novice referees. However, the fixations of expert referees were longer than those of novice referees, and the locations of fixations of expert and novice referees were different. This suggested that the difference in visual search behaviour of expert and novice referees was one of the factors contributing to better decision making of expert referees.

REFERENCE: Aghakhanpour N., Abdoli B., Farsi A., & Moeinirad S. Comparison of Visual Search Behavior and Decision-making Accuracy in Expert and Novice Fencing Referees, Optometry and Vision Science: July 2021 - Volume 98 - Issue 7 - p 783-788 doi: 10.1097/OPX.0000000000001726

Rugby Goggles To Correct On-Field Vision

In the past, Rugby Union players have not been able to wear spectacles for on-field vision correction. Spectacles are not practical for such a physical contact sport making participation in the sport difficult for people who are not suited to contact lens wear. With this in mind and a clear desire to make rugby a more inclusive sport option the Laws of Rugby were formally amended in 2019 to allow players to wear goggles with corrective lenses fitted inside them.

While the different jurisdictions may have variations on the requirements for goggles there have been some standout events in New Zealand such as the 2019 announcement by Ardie Savea that he would wear rugby goggles in the All Blacks' clash against Canada, after trialling them in training. As he explained at the time, his vision was deteriorating in his left eye and he was concerned about further loss of vision. The following research by Little et al. showed clear evidence that goggles can be an acceptable addition to the rugby player's uniform.

Eyewear for Rugby Union: Wearer Characteristics and Experience with Rugby Goggles
(Little et al. 2021)

World Rugby developed goggles suitable for use while playing rugby for the purposes of growing participation amongst those that need to wear corrective lenses. The need to correct vision with spectacles is common, and contact lenses are not worn by more than 80% of spectacle wearers. The study by Little and colleagues reports on the profile and experiences of goggle wearers. They canvassed 387 players who received the goggles using an online, 75-item questionnaire. Data obtained from the 188 (49%) respondents showed 87% of the respondent group "strongly agreed" or "agreed" that goggles are beneficial and 75% were happy with goggle performance.

Problems reported by 49.7% and 32.6% of respondents were issues with fogging-up and getting dirty. Fifteen players (8%) stopped wearing the goggles citing fogging-up, limits to peripheral vision and poor comfort/fit . Injuries were reported in 3% of respondents, although none of these players stop wearing the goggles. From the positive experience of players in the trial, the goggles were adopted into the Laws of the game on July 1, 2019.

REFERENCE: Eyewear for Rugby Union: Wearer Characteristics and Experience with Rugby Goggles. Little J., Eckert F., Douglas M., Barrett B. Int J Sports Med. 2020 May;41(5):311-317. doi: 10.1055/a-1068-9501. Epub 2020 Jan 27.

More on Injuries

Injuries are common during most contact sports and Rugby is no exception. So this issue of Primary Eyecare closes with an interesting US report on the prevalence of maxofacial trauma in rugby.

Rugby-related adult maxillofacial trauma injuries: a NEISS database study
(Lafferty, et al. 2021)

The primary objective of this 2021 study was to delineate the data on maxillofacial trauma in rugby utilizing the National Electronic Injury Surveillance System (NEISS) database. By establishing the prevalence of facial rugby injuries in terms of age, mechanism of injury, and degree of injury Lafferty et al. sought to aid and inform the development of better ways to limit facial trauma in the future.

The NEISS database, originally a statistically valid injury surveillance system for collecting data on consumer product-related injuries occurring in the United States, was expanded in 2000 to collect data on all injuries for the Centers for Disease Control and Prevention through an interagency agreement. NEISS is based on a nationally representative probability sample of hospitals in the U.S. and its territories.

Each participating NEISS hospital reports patient information for every emergency department visit. The total number of hospital emergency department visits nationwide can be estimated from the sample of cases reported in the NEISS.

The researchers accessed the NEISS database in February 2020 in order to identify adult patients (> 19 years of age) presenting to the emergency department (ED) for rugby-related head and facial injuries from the previous 10 years (2009-2018). In total 507 patients (national estimate = 18,952) from 2009 to 2018 were identified as appropriate for study inclusion.

The most common injuries were those to the facial region including the eyelid, eye area, and nose (59.4%).

The most frequently encountered facial fracture while playing rugby was the nasal bone (58.6%). Overall, 98.4% of patients who presented to the ED with rugby injuries were treated and released, 1.2% were admitted or observed, and 0.4% left against medical advice.

This research provides a useful quantification of facial and head injuries near the eye and with the rugby season coming up it is inevitable that some similar injuries will present to general practice over winter. In this respect it is encouraging to note that the vast majority of players with facial injuries injuries including eyelid and eye area are most likely to be treated and discharged.

REFERENCE:
Rugby-related adult maxillofacial trauma injuries: a NEISS database study. Lafferty D. , Pion T., Cohn J., Shokri T., Ducic Y., Sokoya M. (2021) Oral Maxillofac Surg., Sep;25(3):389-393. doi: 10.1007/ s10006-020-00925-9. Epub 2021 Jan 7.

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