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## “Sports vision: Introduction, Ocular Hazards and its preventive measures” – A review

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### ABSTRACT:

An athlete's performance is fully dependent upon the vision, including the clarity of vision, motor performance and information processing. For maintaining a good sports vision some visual skills for all sports include: visual acuity, eye tracking, eye hand coordination, visual memory, peripheral vision and stereopsis. The blunt eye trauma is the most common ocular injury in sports which includes: orbital blowout fracture, black eye, subconjunctival hemorrhage, hyphema, retinal hemorrhage, iris injury, vitreous hemorrhage, choroidal rupture, Retinal detachment. Penetrating eye injury, radiation eye injury and chemical eye injury are less common ocular injury compared to blunt trauma. To prevent the ocular injuries, athlete's should be provided with some protective measures such as eye protectors, Resilient plastic wrap- round frames, CE approved goggles, scleral contact lenses, soft contact lenses, UV blockers.

### KEYWORDS:

Eye hand coordination, vision, visual memory, protective measures

### INTRODUCTION:

As we know that vision is important for our daily activities, similarly good vision is also important for sports. An athlete's performance is fully dependent upon the vision, including the clarity of vision, motor performance and information processing<sup>1-5</sup>. For maintaining a good sports vision some visual skills for all sports include: visual acuity, eye tracking, eye hand coordination, visual memory, peripheral vision and stereopsis<sup>1-2</sup>.

## **Sports vision testing:**

Sports vision examination is quite different than a regular eye examination. Optometrist/ or an eye care professional who are more expertise in sports vision assessment should examine the vision and eye examination<sup>1,2,10</sup>.

### **❖ Visual acuity:**

Decrease in visual acuity may cause inability to see and recognize small objects clearly. Perfect visual acuity for sports vision is 6/6. Good visual acuity leads to good performance of athlete's. Visual acuity can be examined by the help of snellen's visual acuity chart.

### **❖ Visual processing speed and Hand eye co-ordination:**

Proper athletic performance in many sports depends mainly upon your visual acuity and hand eye coordination (your reaction towards object). Examples: badminton, tennis, cricket, volleyball, basketball etc. Everything requires a good hand eye co-ordination.

### **❖ Eye mobility:**

Good eye mobility helps athlete's to locate the landmark and follow objects quickly and most accurately. Saccadic and pursuit eye movements must be examined.

Test procedure:

- The patient should stand directly in front of the examiner.
- Instruct the patient not to move his/her head.
- Two modified Golden fixation sticks along with green and red dots are used and hold no farther than 40 cm from the patient.
- The target should be hold about 10cm from the midline of the patient.
- The patient is instructed to look at the target. ie. red or green. "Don't look until I tell you".
- Then call out red and green and repeat this so that the patient has to make 10 saccades( five to the red and five to the green targets)<sup>9-10</sup>

### **❖ Contrast sensitivity:**

The contrast sensitivity helps to know individuals functional visual capabilities, which is very important for athlete's to identify and track objects against various backgrounds and varying lighting levels. Examples: Basketball, Badminton, cricket etc. playing during a night time. Pellirobson chart is used to examine the contrast sensitivity.

### **❖ Eye dominance:**

Dominant eye act as an aid in performance of an athlete's in variety of sports like: target shooting, golf and arching.

### ❖ **Stereopsis:**

It is the ability of brain to neurologically integrate and fuse two horizontally disparate retinal images, producing a sensation of depth. It helps to calculate the distance between the athlete and target (i.e ball, Opponents, as well as teammates). Titmus fly test and TNO is used to examine the stereopsis.

### ❖ **Color vision:**

Color vision test easily can be determined by the help of Ishihara test. Sports like Basketball, table tennis, running race, etc. totally depends upon the color of ball and pattern of track. So good color vision of the athlete's helps them to perform better in their game.

### **Ocular injury:**

In comparison to other sports injury, ocular injury is very less in number. Some of the ocular injury occurring during sports are listed below<sup>7-8</sup>:

#### ❖ **Blunt eye trauma:**

It is the most common sports related eye injury, mostly seen in Badminton, volleyball, Hockey, Baseball and cricket. Some examples of the blunt eye trauma are: orbital blowout fracture, black eye, subconjunctival hemorrhage, hyphema, retinal hemorrhage, iris injury, vitreous hemorrhage, choroidal rupture, Retinal detachment.

#### ❖ **Penetrating eye trauma:**

It is less common than blunt eye trauma. Penetrating eye injuries are caused by the foreign body like broken glass, dust, stone, flying debris, fishing hooks or in contact with the other player's equipment. It can cause permanent vision loss, depending upon the depth of penetration.

#### ❖ **Corneal abrasion:**

Corneal abrasion occurs when small flying particles or debris blow into an athlete's eye and it may also due to contact of player's fingertip / nail.

#### ❖ **Radiation eye injury:**

Pinguecula and Pterygium are the result of exposure to UV light in snow skiing or surfing and water skiing as well as other water sports. Reflection of sunlight will be more from snow and water, so chances of occurrence is more.

### ❖ **Chemical burn:**

Chemical powders and spray paint used to mark the lines on field can accidentally get into an athlete's eye. Acid and alkali can cause permanent blindness while other normal chemicals can cause irritation.

### **Aspects of ocular examination:**

Sports related ocular injuries can be examined on site with the adequate medical tools<sup>1,2,6-9</sup>.

- ✓ Firstly, appropriate history should be obtained for proper investigation and diagnosis.
- ✓ Best corrected visual acuity should be checked using snellen's chart.
- ✓ Visual field can be examined by the help of confrontation. Any defect in visual field suggest: Retinal, Optic nerve, or central Nervous system injury.
- ✓ Pupils should be examined with a bright light source, and should check for anisocoria as well as for Relative Afferent Pupillary Defect.

If light reflex is diminished in one eye, a swinging flash light test helps to discriminate between an afferent(retina or optic nerve) lesion and an efferent ( 3<sup>rd</sup> nerve or pupillary muscle) lesion.

- ✓ A penlight (torchlight) examination of the anterior chamber should be performed to check for foreign bodies, Hyphema, abrasions and laceration.
- ✓ Extra ocular motility test should be done to rule out any obstruction in motility in all position of gaze. Elevation of gaze may be limited by an orbital floor fracture. Double vision in any gaze position suggests significant injury in one or both eyes.
- ✓ External examination is then performed. Signs of orbital injury include periorbital ecchymosis, edema, proptosis and bony step-offs of the orbital rim.
- ✓ Finally, funduscopic examination is done to evaluate the glow of fundus and its nerves.

## Preventive measures:

Different sports have different techniques to play a game as the method is different from one another, there are different instruments which can be used as an preventive measures from ocular injury as well as to enhance the vision for better performance. Some of them are listed below:

Sports	Protective measures
Football	Soft contact lens
Racquet hockey	Eye protectors, tinted lens
Cycling and skiing	Resilient plastic wrap- round frames with impact resistant lenses. UV blockers and high optical centres for cycling.
Fishing	Plastic lenses, Bifocals with low segments, polarizing lenses and tinted lenses
Golf	Eye protectors, large eye sizes, Tints/ photochromic lenses, low segment, add bifocals or single displaced segment
Shooting	Plastic spectacle lenses, Tinted lenses to enhance contrast,
Water sports	CE approved goggles, scleral contact lenses, soft contact lenses, UV blockers, saline rinse, silicone hydrogels for long distance events

## Conclusion:

Large numbers of athlete's never had an eye examination and they have limited access to evaluate. After having their eye examined their visual acuity can be optimized by the help of Glasses, Contact lenses: soft or RGP, orthokeratology, and Refractive Surgery: Lasek, Lasik or implant lenses, which helps in good sport result. Sports vision training also provides an opportunity for the athlete to enhance vision and visual performance factors that are important for their sport.

Small and fast projectiles like: Gun shooting, paintball as well as hard projectiles like: Cricket, Hockey, Baseball falls under the high risk category of sports eye injury. So proper care and protective equipments should be used during these games to reduce the eye injury.

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