The Impact of Vision on Sports Officiating

Visual Attention

The eyes are the official's most significant sensory receptors. The eyes send information to the brain where it is integrated and interpreted as a three-dimensional (3D) phenomenon. The integration of visual information from both eyes into a 3D image is called **fusion**. Without a conscious effort to attend to something, the eyes will continuously move throughout the visual field. When something gets our visual attention we may focus both eyes on the object. This pause is called a **fixation.**

Fixations are important because focusing ability is limited to 3 degrees (Kluka, 1991). Our ability to see fine detail is limited to being able to focus both eyes on an object that we can keep within this small arc. The Thumb Rule can be used to get a feel for the size of this area of visual focus. Extend your arm forward, holding your arm straight with your thumb pointing vertically. The width of your thumb in this position is a good approximation of the focus of your visual field. Note that as you read these words and you focus on one word, the words to either side in your peripheral vision are not in focus.

Because the focus of the visual field is so small, peripheral vision becomes very important, particularly in sport. Peripheral visual information is processed quickly to facilitate the detection of motion so that visual focus can be directed to other events. One objective as an official is to view as much relevant information in as short a period of time as possible in order to make the appropriate call in a timely manner.

Eye Movements

Four types of eye movements are generally used to facilitate officiating performance:

Smooth pursuit – exhibiting a 125 millisecond delay with velocities up to 70 degrees per second

Saccadic – exhibiting a 200 millisecond delay with velocities up to 1000 degrees per second (Note that a person can continuously track a moving object at about 70 degrees per second – a volleyball, spiked by an outside attacker produces angular velocities greater than 500 degrees per second)

Vergence – The ability to focus on one point in space at a time as the object or athlete approaches or moves away from the official

Vestibule-ocular – this assists in body balance.

For example:

1. The hockey official scans the field using **saccadic** eye movements, jumping the eyes quickly from one fixation point to another to gain information to identify the readiness of both teams just prior to the beginning of the match.
2. When the official thinks there is appropriate readiness, they initiate play. The official then uses **smooth pursuit** eye movements to track the ball to its initial contact.
3. As play develops, the official uses **vergence** eye movements to track an approaching ball or player.
4. Throughout all of this, **vestibule-ocular** eye movements are used to compensate for the movement of the official's head.
5. Because the velocity of the ball can reach 90 km/hr, angular velocities produced can be greater than 500 degrees. Therefore, officials must use **saccadic** eye movements when tracking the ball to contact with the stick.

Visual Accuracy

The ability to visually discern detail in an object is called **visual acuity**. It is most commonly evaluated by the Snellen Eye Chart where the smallest feature (usually letters) discernible is evaluated in high contrast conditions. There are many factors that affect visual discrimination or acuity, including contrast, lighting, motion, time, colour, age, and attentional demands. The most important factors appear to be contrast and lighting. If the contrast between object and background is low, the object needs to be larger to have similar visual delectability to a smaller object with greater contrast. Greater illumination tends to improve acuity, but this effect tends to decrease, and too much light may create glare that interferes with vision.

The perception of colour affects visual acuity. Some people have difficulty discriminating between red and green, or between blue and yellow. This colour deficiency is found in about 8 to 10% of males and less than 1% of females. Male officials may find it helpful to have the visual ability checked. When officiating, evaluate uniforms, signs, or other items for colours that contrast and are not combinations of red/green or blue/yellow.

Visual Errors

The visual demands of sports officiating are sometimes beyond what is physically possible. Players must learn that they are often just as likely to make a visual error as officials are. Errors can be made because the event is too short to even be observed, the vantage point is inadequate to make a correct judgment, the eyes could be focused on a different position than the key event, or the timing was inappropriate and the eyes were "turned off" during a saccade or blink. In short, there are many good reasons that an official could appear to be looking right at a key play and still "miss the call." An understanding of being fooled by a bad vantage point or a short duration event can help officials, players, and coaches maintain the appropriate emotional state for competition when unexpected calls or non-calls occur.

Two Vision training exercises
Goal: Visual Accommodation and Conditioning **Equipment/Set-up**: 3 X 5 index card with sport-specific terms or exercise instructions on the card. Place the card in the line of vision of the exercise (on the floor for push ups). **Task**: Perform the exercise while focusing the eyes on the words. Use cues like "keep the word in focus as long as possible." **Variations**: Focus on individual words moving in a clockwise and then counter-clockwise direction, vary card position, and vary exercises (push up with clap).
Goal: Contrast and Focused Attention **Equipment/Set-up**: Paint or purchase a ball or object that is similar to the colour of the background it is used on (ice hockey: white puck; field hockey: green ball). **Task**: Practice drills in low contrast conditions. Build up to 10 minutes of practice with similarly coloured objects **Variations**: Vary practice tasks and use number of executions rather than time limits.

Several motor behaviour principles are important to facilitate officiating:

1. Focusing skills decline with age. Officials who are approaching 45 years of age should pay particular attention to getting annual sports vision examinations by eye care professionals.
2. Head movements can affect the acquisition of relevant information; however, using the eyes rather than the head and eyes to locate action is more efficient. Perhaps during ratings of officials, videotaping of officiating performance could include focusing on eye/head movements as plays develop.
3. The smaller the visual focus on the target, the more accurate the result will be. When focusing on play, tighten focus to as small an area as possible;
4. The shorter the period of time to focus on the object, the more intense the focusing must be to pick up relevant cues. Opening the eyes wider just before critical play will assist intensity of focus.

Visual skills for officiating should be evaluated in a complete vision examination by a sports vision eye care professional.