

Visual Performance

The better you see, the better you can shoot. Let an expert show you the ways in which your vision might be impacting your shooting.



LEFTY RAY CHAPA

Haylyn



BY ED LYONS

One of the most common questions that I received during the lockdown periods in the U.K. was, “What can I do to improve my eyes or keep them tuned up for when I return to shooting?”

While shotgun shooters are always interested in the latest cartridge, choke or colored lens, this shows that more people are now becoming aware of how they can actually enhance their own personal performance, rather than just relying on purchasing more expensive equipment.

Since 2010, I have examined the eyes of more than 1,500 shotgun shooters from 42 countries around the world. Whether amateurs or Olympic medalists, world champions or Special Forces operatives, without exception, all of the highest-performing individuals have superlative visual skills.

While the vast majority of us can see well, the elite often see better.

It's important to note that although having “perfect eyes” does not make the perfect shooter, vision and shooting are intrinsically linked; the ac-

curacy with which you see the target dictates how you make the move to shoot it, and the coordination and synchronicity of your eye muscle system can be linked to how repeatable that first dead pair becomes.

Approximately 90 percent of all sensory information that we take in when we are awake is visual, so it makes sense to ensure our eyes are performing to their best. Simply put, we can't hit what we can't see.

In a perfect scenario, it only takes a matter

of milliseconds for our visual system to inform us of a target's speed, trajectory and position in space. It is then the job of the motor system to facilitate smooth hand-eye coordination to break the clay. How does this happen and what problems can arise?

We often acquire a target as movement in our peripheral retina, then use our central vision to maintain fine focus on the bird. The barrels should remain purely in our peripheral vision. Bouncing fixation from the bead

to the bird or “measuring” the lead can mean our eyes get stuck in no man’s land between the barrels and the target. This is particularly problematic for sim pairs on a sporting course or when presented with a covey of driven birds when game shooting.

The basic pathway of the light through the eye is as follows: tear film, cornea, pupil, lens, vitreous, retina. In an ideal situation, light from a target passes through the ocular media smoothly and is accurately focused at the back of the eye. In my clinical practice, I often encounter shooters whose performance issues — many of which manifest as eye dominance problems — can be traced to defects with just one or a combination of the above.

Tear Film: Our tears are made of three main layers. A mucin layer sticks the tears to the eye, helps to nourish the cornea beneath and helps the middle watery layer to slide evenly over the surface. The watery layer helps prevent infections and washes away debris. The outer layer of our tear film is an oil or lipid-based layer that seals the tear film and reduces evaporation.

Different types of dry eye conditions disrupt these layers and can have detrimental effects on our sight, as well as the comfort of our eyes. Occasionally,

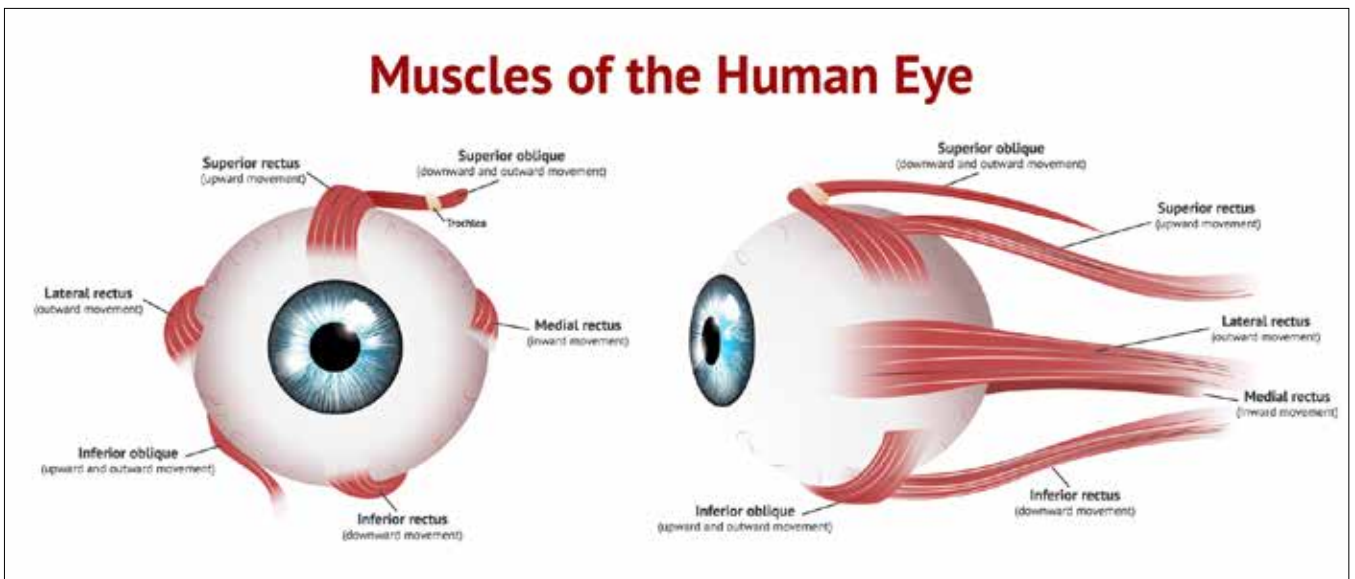


a \$10 bottle of eyedrops can have a far greater effect on target sharpness than a \$200 lens.

Cornea: Our cornea is the outermost layer of the eye and is a highly organized sensitive tissue that comprises 65 to 75 percent of our focusing power. The cornea can be affected by dry eye as described above, types of dystrophy and also foreign bodies — this is what your shooting glasses protect. They may be a pain, but getting clay fragments in your cornea is no fun at all!

▲ Perfect eyes do not make a perfect shooter, but good vision and good shooting go hand in hand.

The Pupil: The pupil is the opening in the center of the iris (the structure that gives our eyes their color). The function of the pupil is to allow light to enter the eye so it can be focused on the retina to begin the process of sight. Typically, the pupils appear perfectly round, equal in size and black in color because light that passes through the



pupil is absorbed by the retina and is not reflected back (in normal lighting). Together, the iris and pupil control how much light enters the eye. Using the analogy of a camera, the pupil is the aperture of the eye and the iris is the diaphragm that controls the size of the aperture — the smaller the pupil, the better depth of field you will have. The old adage of “use the palest lens to allow the most light into your eye” comes from this, but it is not always appropriate advice for all. Some shooters (myself included) are light sensitive, so they need a darker lens to preserve visual comfort — any visual advantage that may be created by a pale lens and a small pupil is dramatically countered by disabling glare. Errors or differences in pupil size and behavior can be physiological (you may be born with it) or can indicate potentially serious general health issues.

Lens: Inside each eye, we have a lens, which is a transparent, biconvex structure that, along with the cornea, helps to refract light onto the retina. As we get older, the lens loses some of its elasticity, and the process of fine focus can become more difficult. This first becomes apparent when we begin to need reading glasses. As we get older still, it becomes cloudy, changing our color perception, reducing focus and eventually developing a cataract, which requires surgical removal.

Vitreous: The vitreous is a clear, colorless fluid that fills the space between the lens and the retina. It is 98% water and 2% collagen and must remain clear in order to not impair the light path. The vitreous is where we find floaters — the annoying whirly, squiggly things that drift around in your vision.

The Retina: The retina marks the finale of light’s movement through the eye. There, visual images are registered by the rod and cone cells that convert light into electrical impulses and transmit them to the brain via the optic nerve. The retina is a layer of nervous tissue that covers the inside of the back two-thirds of the eyeball, in which stim-

ulation by light occurs, initiating the sensation of vision. The retina is actually an extension of the brain, formed embryonically from neural tissue and connected to the brain proper by the optic nerve. The most common causes of retinal damage I see in practice are caused by diabetes — if you are diabetic, it is vital to keep your blood levels stable — and macular degeneration, which can be hereditary and linked with smoking and exposure to UV light.

▶ Author Ed Lyons at work with a client. Ed is a U.K.-based optometrist and works with shooters on their vision.



Now that we know about the basic pathway through the eye, we’ll dig into the term “visual skills.”

VISUAL ACUITY — SHARPNESS OF VISION

Visual acuity (VA) is the term used to denote the best standard of retinal sharpness one can achieve in a natural state, or using glasses/contact lenses if required. We are best to think of our eyes as a pair of video cameras, and the higher the resolution, the better. Sometimes, we may have one “high-def” eye and one with lower resolution (a common cause of eye dominance problems as we get older), and in some cases, both eyes may only be able to achieve low levels of VA. A high level of

VA allows faster target acquisition and identification of the bird as it passes across complex backgrounds.

We can be short- or long-sighted (also referred to as near- or far-sighted), or have astigmatism, and still achieve a high VA as long as the error is accurately corrected by glasses or contact lenses. The well-known 20/20 standard does not denote perfect vision; simply put, it means that someone can see a target at 20 feet away that has been designed to be seen at 20 feet away. 20/20 is actually



average, and many top-level shooters will exceed this by some degrees.

Often in my practice, once a high level of VA has been achieved through enhanced prescription lens technology, I receive feedback about how scores have subsequently increased. While some studies have shown that high VA is not a prerequisite for success in shooting, my experience of assessing the visual skills of club, county and international shooters suggests otherwise — the better shooters have a higher standard of VA. However, while VA is undoubtedly important, this is only one of a number of key visual skills that successful shooters will typically excel in, and these visual skills can be assessed and improved in others.



Color Vision and Contrast Sensitivity: This is the ability to see subtle differences in color and gray tones in a range of lighting levels — older shooters may see very well in good daylight but struggle at dusk or dawn or when shooting under floodlights.

Everyone's visual system is different, which is why tint selection for shooting glasses is very specific to the individual. Fortunately, there is a very wide range of tints available to suit most frames and all budgets, but for the shooter who struggles in lower light, an eye examination is recommended.

Binocular Vision and Oculomotor

▶ As we age, our ability to see subtle differences in color can be affected, leading to trouble seeing targets well at dark, dusk or under lights. An eye exam is recommended.



▲ World Compak Champion Amy Easeman is wearing a set of high-contrast prescription glasses the author made for her to address contrast sensitivity.

Balance: Eye teamwork. This term refers to how well the eyes work together and how well they continue to work when the system is stressed. I used the analogy of a pair of video cameras above — in order to move these cameras around, we have six pairs of eye muscles, some of which have primary, secondary and even tertiary actions. We have muscles for lateral movement, vertical movement and elements of rotation, which are linked to gaze stabilization and balance, not to mention those tiny muscles that are involved with helping us to focus.

Our eyes can be perfectly clear but

may not work as a pair. This can affect performance consistency and the perceived location of the clay. To achieve clear binocular vision, both eyes should be pointed at the object of regard so that the images fall on corresponding points of the two retinas. If this is done incorrectly, double vision can occur.

True “double vision” is not to be confused with physiological diplopia — a normal phenomenon in which objects not within the area of fixation are seen as double. When someone with normal vision focuses on an object, everything in front of the object appears double, and everything behind the object appears double. This is suppressed in everyday life but often reported by the shooter as “seeing two barrels” when staring at a clay. Currently there appears to be a trend for sellers of “eye dominance correction” items to incorrectly suggest this in itself indicates an eye dominance problem, which it categorically does not. Errors with our oculomotor system (eye muscles) will lead to inaccurate tracking, eye dominance problems, eye fatigue and inconsistency, among other things.

Fusional Reserves: This refers to eye muscle strength and flexibility. Poor performance here can lead to transient dominance shifts and general visual fatigue. Our fusional reserves can be assisted with visual training exercises, if deemed appropriate.

Stereopsis: Accuracy of depth perception. Our depth perception can be hampered by eye muscle issues — it’s worth noting that some forms of laser treatment and contact lenses will impair stereopsis, as will closing an eye. However, we know there are some fantastic shots (Dave Carrie, Veteran World FITASC Champion 2014; Suzy Balogh, 2004 Olympic gold medalist, for example) whose shooting performance isn’t negatively affected by limited stereopsis.

Eye Dominance: This refers to which eye is in charge, and it is an article all on its own! Unstable eye dominance will affect balance, aiming and target acquisition. Its relationship with



▲ World FITASC Champion Ed Solomons is shown here wearing some darker lenses that help with light sensitivity.

handedness can have a dramatic effect on how well a shooter will perform. Simply put, if there is an error here, the gun might not be pointing where the eyes are looking.

However, we know there are some excellent shooters who do not have perfect right hand/right eye or left hand/left eye dominance, but through experience and practice, they have learned the correct sight pictures. The most frustrating issue is when the eye dominance fluctuates, so we lose our visual consistency.

As our visual system is muscular, our eye dominance can become affected by stress, tiredness, dehydration, glucose levels, hormone levels and reactions to some medication, along with an enormous list of other factors. This is why there is no cure-all gadget to fix this incredibly complex issue.

Visual Field and Peripheral Awareness: The vision around you and how you integrate information in it with your central vision. Our visual field

(VF) is essentially what we can see ‘out of the corner of our eye’ — that is, if we are focusing on a central target, what we can perceive around this.

A ‘scotoma’ is the term given to an altered or reduced area in our visual field. The VF can be reduced permanently or temporarily by physical conditions such as glaucoma and migraine. Large noses, poor gun fit and inappropriate eyewear can also cause scotomas, as portions of the vision can be blocked.

In 2017, I examined a trap shooter who was struggling with left-to-right targets and had been diagnosed with an eye dominance problem. What he actually had was a scotoma caused by a brain tumor. In this case, shooting literally was a life saver.

While there are myriad other factors that go into becoming a Master-class or AAA-class shooter, vision is a small but vital piece of the performance jigsaw puzzle, and one that can be easily assessed, analyzed and improved.

As James Clear states in his Continuous Improvement theory, in the beginning, there is basically no difference between making a choice that is 1 percent better or 1 percent worse. (In other words, it won’t impact you very much today.) But as time goes on, these small improvements or declines compound, and you suddenly find a very big gap between people who make slightly better decisions on a daily basis and those who don’t. If you get 1% better each day for a year, you’ll be 37 times better when you’re done.

See better, shoot better! **CTN**

► Ed Lyons is a Visual Performance Consultant based in Wolverhampton, England, and is a Director of Flint and Partners Optometrists and www.edwardseyewear.com. He has developed an innovative approach to assessing the visual profile of an athlete that has seen his clients win domestic, national, international, world and Olympic titles. He has helped world champion shooters with their vision for years.