Dear Colleague

**The origins of rifle shooting in optics**

**Problem:**rifle shooting is to a large extent based upon two principles concerning the eye:

* optical vision
* functions of the brain which occur following the transmission of an image from the retina.

Rifle shooters rely upon the brain functions to achieve the smallest possible groups, 0.5 MOA (F Class) and 1.0 MOA (TR). Yet, many shooters are unsure how they can result in such small groups. This is because brain functions are little understood. Some shooters rely upon personal experience in using them. Otherwise, the majority of shooters appear to have no idea of the existence of brain functions, much less how to use them to affect the size of a group.

All shooters are aware that brain functions can change an image. Students are taught at school that there is a small non-functioning area in the outer part of the field of vision, a result of light not being absorbed by retinal cells where the optic nerve joins the eyeball. As a result, when looking at waves on water, there is no grey or non-visible area, because it has beenpatched in. That is, the brain appears to have created a small area of water waves to match what the eye is looking at. It must be concluded that the brain is highly versatile, being able to create an image resembling whatever a shooter looks at, whether grass, sky or trees.

From this, a question should arise in the mind of a shooter: what else is the brain able to do which affects what we see? Can the brain enhance a shooter’s group? If so, then how may brain-enhanced vision render a group more easily achievable?

This article describes very basic visual techniques and certain brain enhancements, which can result in a smaller group. The latter are largely anecdotal, from the experiences of leading shooters over many decades.

**Discussion:**the techniques concern the ring foresight, distinguishing between a visual image and brain functions, which accompany the image. For this, it is critically important for the shooter to use a ring with an accurately measured:

* inner diameter
* thickness or annulus.

Shooters who achieve the cited groups use a matching combination of internal diameter and ring thickness. This results from the following experience. If the eye has to focus upon a very fine dot and similarly fine lines at the target edges, then a thinner ring facilitates this. A thicker ring used with very fine detail appears to result in a wider group. Note that this finding is anecdotal.

A particular brain function is of value to all shooters, including F Class, who are otherwise not concerned with rings. This brain function is of value when using a kg weight trigger. For this, shooters need to mentally concentrate upon the stage reached while pulling the trigger. This keeps other mental processes focused upon the technique, i.e. holding the ring at a particular distance from the aiming mark, while at the same time, keeping the foresight dead still at the same time as pulling the trigger. As a result of this, the shooter’s mind is not allowed to wander off before release has occurred.

The width of a ring appears to be more easily used in aiming if a further brain function is used. Whether using blade or ring foresights, it has been found that if the surface of the blade or ring is held very close to the aiming mark, stray shots can occur well outside the group if the time for aiming and shot release takes about 10 seconds. However, it has been found that the stray shots can be almost eradicated if the time for aiming and shot release is reduced to 2-3 seconds. As well, the group can be much smaller with no sign of wide shots. Similarly, if the blade or ring is placed even further away (at the edges or corners of the target) from the aiming mark, then either of the 2-3 or 10 second shot releases can result in a small groupthe size of the V-bullwith no wide shots.

On the other hand, when positioning the ring halfway between the aiming mark and the edge of the target, a larger group occursthe size of the bullseye, also with no wide shots.

Use of a wider area in which to centre the aiming mark correlates with the anecdotal evidence from a person who watches a fly walk toward the centre of a window pane. When it reaches the exact centre, the mind is able to state this with confidence, without using a ruler to measure the distance of the fly from the edge of the pane. It has as a result been concluded by many shooters, that the mind possesses a function in which it is able to automatically centralize an aiming mark within a wide ring (connecting the corners of the target).

There are other critically important features of the aiming process which shooters need to follow:

* it is impossible to focus equally upon both the ring and the aiming mark
* a small group can be achieved if the ring is sharply focused, allowing the aiming mark to be seen as an indistinct blob (but not the reverse)
* the width of the rear aperture must be the smallest size which just allows background light intensity to be seen through it (if the aperture is any larger, then light intensity remains the same, but the size of the group expands greatly)
* at this setting of the rear aperture, its diameter is equal to that of the pupil of the shooter’s eye and hence, there is no need to adjust the position of the head to centralize the foresight in the rear aperture.

To adjust the rear aperture to the smallest diameter, the aperture should be first closed, then with the eye close to it in the aiming position, it should be gradually opened from black until the light seen through it is has the same intensity as ambient light outside the sight.

**Practice:**many leading shooters prefer to use a 0.5 mm thick plastic ring at long range (800m and 900m), which appears as a sharp line around the small aiming mark. Many shooters have been so encouraged by this, that they use the 0.5 mm ring at all ranges from 300m to 900m. This can also be achieved with either a standard ring or the Eagle Eye.

There are two further techniques that facilitate brain enhancement of the visual image during shot release:

* holding the rifle dead still
* mentally focusing upon the trigger pull to facilitate the follow-through process.

It is usual to utilize the principle offollow-throughto overcome the likelihood of a shot going astray. This can occur due to the brain prematurely switching to the next step to be followed, e.g. to look at the screen or reload. The follow-through technique solves this problem when the mind is kept focused upon the stage reached during trigger pull. When continued, right through to the moment when the shot is released (as a surprise), the resulting group is smaller with no stray shots outside the group. This also makes it possible to release a shot without exceeding the required degree of care needed to avoid generating a nervous system tremor.

**Conclusions:**shooters need to use ring diameters and thickness to enable them to achieve the small group sought in TR. However, when these shooters choose to use such a ring, they also have a need to hold the rifle dead still while mentally monitoring trigger-release. It is critically important to mentally monitor shot release in both F Class and TR, to not only achieve follow-through, but avoid generating a tremor and hence a much wider group.

Note: centering the foresight within the rear aperture is an old army technique to allow for the oversize aperture of the Lee Enfield No.4, Bren Gun and other weapons. If the shooter has accidentally set a wider rear aperture than required, then centering can be a wise precaution.

Happy New Year

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