FRIENDS OF NEUROVISUAL TRAINING NEWSLETTER. ISSUE 3, VOLUME 2.

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Introduction.

In this week's issue of the Friends of NVT newsletter, we discuss one of the three pillars of NVT, eye discipline. We discuss testing methods, use of the retinal after image, progressions, and application to post-TBI rehab and performance enhancement.

Our "How To" this week also discusses eye discipline as we dive deeper into our methodologies to assess and train eye discipline. Within this section we present a few images used to test eye discipline so feel free to test yourself!

Also be sure to check out this week's announcements as we highlight a very interesting new paper out of Duke University further validating NVT's correlation to improved batting averages in baseball players.

As always, thank you for your continued support and interest in NeuroVisual Training!

Fixed Gaze and Eye Discipline.

When we talk about Neurovisual training (NVT) we refer to the 3 pillars (Friends of NVT Issue 1, volume 1). One of those pillars is eye discipline, which we are going to talk about today. Eye muscle movement is extremely important, but it is also important for the eyes to be able to stay fixed on an object without twitch or tremor. The eye muscle memory to triangulate onto a point is a critical component of depth perception and if the eye muscles are not "disciplined" during that triangulation, depth perception can be negatively impacted. In the How To section we'll discuss how Eye Discipline training can be done. In this article we'll discuss what we are doing and why it is important for Friends and Practitioners of NVT.

Please note, we are not taking about gaze stabilization here. That will be discussed in another issue.

A common method for testing and training eye discipline or fixed gaze is with tracking or Wolf Wands. The trainer will have a person track and hold a gaze at a fixed position and watch to see how good the gaze is. This method has a tremendous advantage in that it can be used to test and train fixed gaze in almost any eye position. A drawback is that it takes two people and the trainer needs to provide the feedback as the subject may not know if their performance is good or bad.

There are numerous eye tracking devices that can monitor what the eyes are doing and provide delayed feedback on if or how the person is maintaining fixed gaze. Another method we've employed with great success for NVT is using the retinal after image to test and train eye discipline. All of us have experienced the retinal retention or after image when we see the flash of a camera, when the flash seems to still be there for several seconds. That vision of the camera flash is the after image and is caused by the opsins in the retina being somewhat saturated and the light signal from the flash remains until the saturation is dissipated.

In the how to section you'll see a picture of a circle with a star in the center. If you stare at the star for 10 seconds then look at the yellow image, you'll see a representation of the circle and star based on the after image. This is easily accomplished with a slide show, like PowerPoint. The after image is seen when you are able to keep your eyes fixed on the star. If your eyes move around a lot the after image is lost. More on this in the how to.

Recall above we talked about the difficulty to provide feedback to the patient or subject about their eye discipline being delayed or subjective based on the trainer? Well with the circle and star image we can train the person to have almost instant feedback if their eye discipline is lost. Keeping your eye (or eyes) on the star you should still see the edge between the green and the yellow. After a few seconds, that edge may become less clear and may disappear altogether. This would be indicative of good eye discipline. Poor eye discipline would have the edges appear as bright yellow or bright green as the gaze is moving around. These bright edges give the person instant feedback that their eyes are not disciplined.

The bright edges occur as part of the retina's saturation of the exposed colors and excitation of the less stimulated colors. This dynamic disparity is interpreted by the brain as bright edges because the other colors had been saturated and somewhat downregulated. Each flash of a bright edge tells us which way the eyes are moving and reminds the subject to keep eye discipline. The result is almost instant feedback and or positive reinforcement concerning the task given the subject.

Once a person demonstrates competency in the primary eye discipline task we can progress them accordingly. Please note, the NVT trainer will make the decision as to what is competent based on the needs of the subject.

One way we like to progress the eye discipline is to add a peripheral vision component. Using a PowerPoint program with the animation settings we can have images appear and disappear in the periphery. We can have characters or alphanumeric move across the

screen. The task for the subject is to maintain eye discipline while engage peripheral vision to see and recall what they are seeing. Now we are doing dual tasking of the visual system by being aware of the after image and of the periphery. When the slide goes on to the blank screen the person should still see the after image of, say the circle and star, and recall what they saw where in the periphery.

We will use the retinal retention methodology as part of an assessment pack to determine if a person has good or bad eye discipline. Retinal retention can also be used as part of NVT for post TBI rehab or performance enhancement. We will do the eye discipline training as part of a therapist-based session or as part of a homework assignment. We always recommend concomitant ocular motor training as well to ensure dynamic ocular motor proficiency does not fall. We can also do this testing and training with two eyes or one eye at a time.

In conclusion one of the pillars of NVT, eye discipline, can be tested and trained using the retinal after image. When doing the training the NVT specialist can make it fun and engaging by progressing the challenges set.

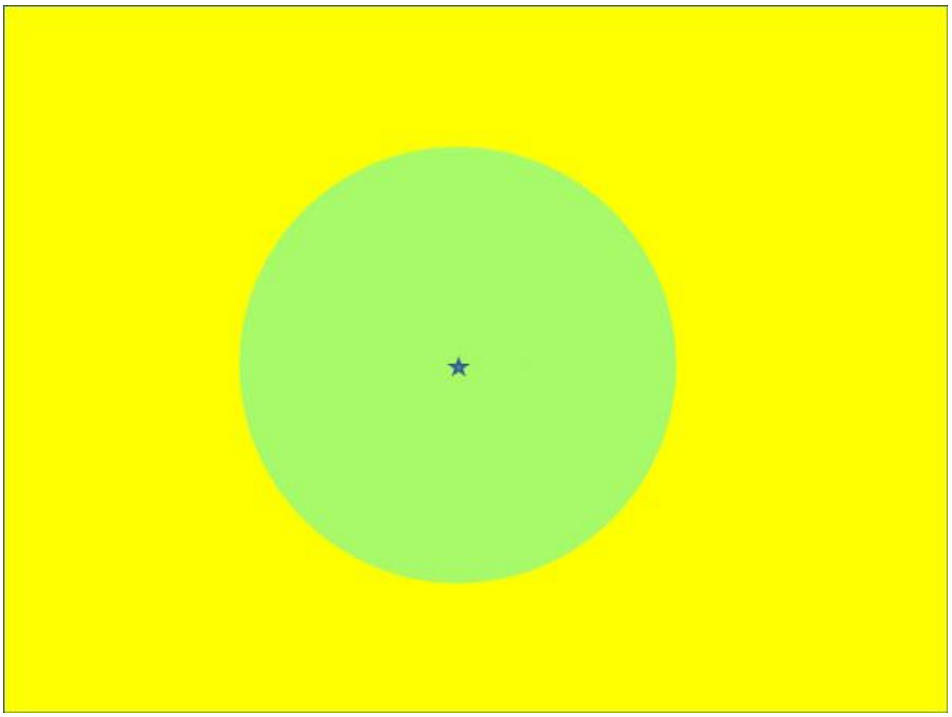
“How To” – Eye Discipline.

There are currently many methods for testing and training eye discipline such as Wolf Wand and eye tracking devices, however, this how-to section will focus on the use of the retinal after image. While Wolf Wands and eye tracking devices are both well-established methods, the use of a retinal after image allows the patient to provide instant feedback, as well as feel themselves improving. Eye tracking devices can also tend to be costly while retinal after image assessment and training techniques can be completed on any ordinary computer.

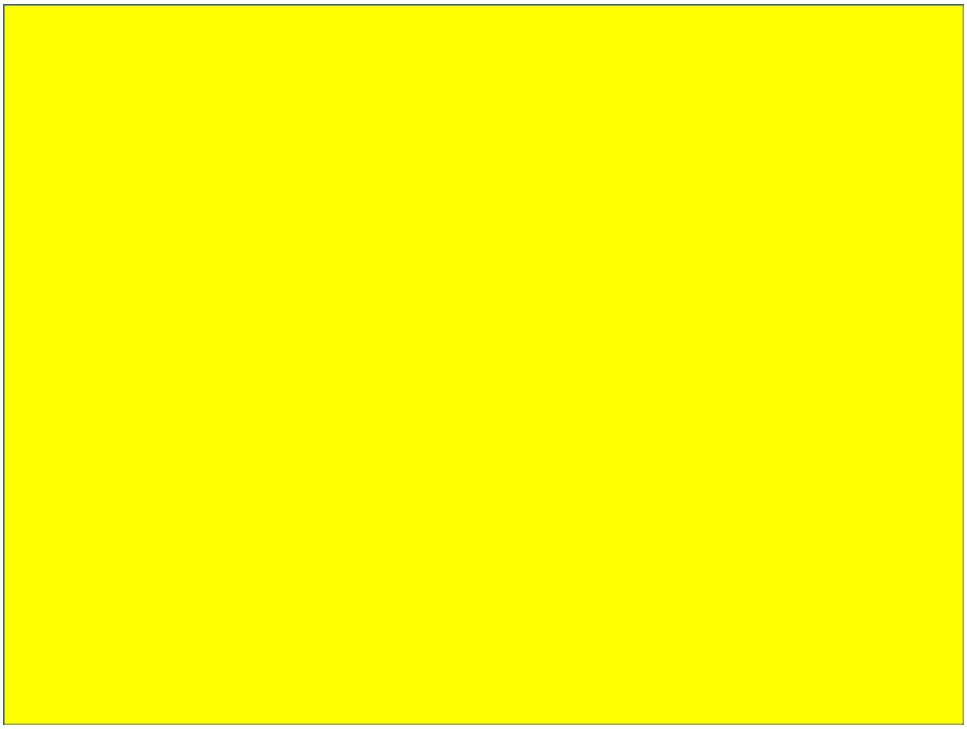
<u>Our Protocol for eye discipline using a retinal after image:</u>

These exercises can typically be completed with simple slideshow, such as PowerPoint, with two separate images, one on each slide.

1. Using slide show mode, stare at the star in the center of the image for 10 seconds. If the patient reports the boarder of the circle becomes fuzzy, this is good as it indicates they have good eye discipline.



2. After 10 seconds have passed, the trainer should page down to the next image. Be sure to instruct the patient not to move their head or eyes.

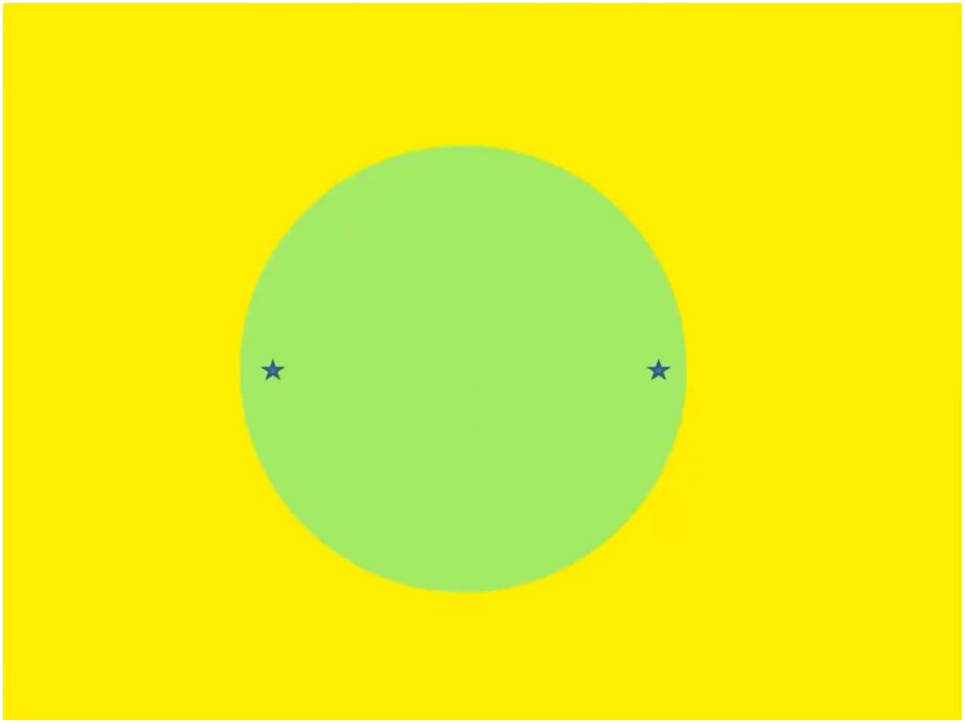


3. Without looking away, the patient should immediately stare at the blank picture and make a mental note of the after image they saw.

4. Ask the patient if the circle was about the same size? Could they still see the star in the middle of the circle? Both are signs of good eye discipline.

Note: Some patients may report seeing an oval or perhaps 2 circles. These claims are likely a result of only one eye working at a time, or poor eye discipline with the eyes moving instead of being fixed. If a patient only has one eye working at a particular time and the eyes continue to go back and forth, the after image may be distorted.

A progression to this exercise is the use of an initial image with 2 stars, as seen in the image below. This progression follows a very similar protocol, however, now instead of focusing on one star the patient is alternating between two stars. By alternating between two stars this trains the patient to have eye discipline while scanning a visual field, very important for activities such as driving and reading.



1. The patient's eyes should bounce back and forth between the two starts for 16 seconds, pausing for a second to focus on each star, before switching to the next blank picture.

Note: It is important for the patient to make a mental note of what they are seeing as their eyes switch back and forth. Once they have alternated stars for a few repetitions, they should begin to see half circles overlap with the green circle of the side of the star they are focusing on, somewhat like a Venn diagram.

2. Again, without moving their eyes or head the patient should stare at the blank picture, making note of the after image they see. The after image should now appear as more of a Venn diagram with two half circles overlapping the center circle.

As mentioned earlier, another progression to this eye discipline exercise is to add a peripheral vison component. Different characters and alphanumerics can be set to display across the screen while the person is staring at the star. The patient should maintain good eye discipline on the star while engaging their peripheral vision to call and recall the aminations they are seeing.

Progressing the subject to more advanced systems with peripheral distractions and identifying shapes and colors around their visual field are ways to advance the subject. These advanced methods help keep the subject engaged and aids in their improved eye discipline training.

It is also important to note that when completing eye discipline training it is key to use a mixture of eye discipline and eye movement exercises. While we do want to train eye discipline, we do not want to train the patient to not move their eyes.

Announcements.

Recently Duke University published a paper that showed a benefit in doing their version of NVT to improve batting of University Baseball players.
https://www.biorxiv.org/content/10.1101/2020.02.12.945824v1.abstract

This paper is an important and logical extension of the paper Clark and colleagues published in 2012 that showed NVT correlated to improved batting average in the University of Cincinnati baseball team.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0029109

We welcome and embrace the confirmation and validation of the 2012 paper because they appear to have seen what we did and improved the methods of the study by adding a control group and randomizing. Having a completely separate group reproduce the results is what leading edge research is all about. Thank You Duke University Baseball.

As always, if there are any questions, comments, or concerns please feel free to reach out to Dr. Joe Clark at clarkjf@gmail.com and please visit www.inneuractive.com for more information on NVT, available NVT products, and NVT services.

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