FRIENDS OF NEUROVISUAL TRAINING NEWSLETTER. ISSUE 8, VOLUME 3.

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Introduction.

Welcome to the final issue of Volume 3 of the Friends of NVT Newsletter! This issue addresses the ways in which humans perceive depth as Dr. Clark discusses how these three processes can work together, as well as how NVT methods can be used to enhance an athlete's depth estimation. Our "How-To" this week continues the discussion of depth perception as it addresses one of the common tools to test stereopsis; the stereo fly.

Lastly, we have many important announcements this week! Please check them out at the bottom of this newsletter after reading the NVT content and "How To". Thanks for staying with us!

Depth Perception & How NVT Can Improve It.

Stereopsis for depth perception is important, but a lot of us see to get overly fixated on specifically stereopsis. Stereopsis is where the two eyes in effect, triangulate to assess distance and aids in the perception of depth perception. But it is only one of three major components in which the human brain perceives depth. Those three ways in which humans perceive depth are:

1. Stereopsis
2. Size Estimation
3. Parallax

Please note, there are some circles that might add accommodation to this list. This claim has validity because if you have poor accommodation it may be hard to do stereopsis or size estimation with an out of focus image. That said, this article will focus on the first three.

Depth perception, 3-dimensional perception, and distance estimation are related but not the same thing. Let us compare depth perception and 3-dimensional perception. If in this

case we take a person who is blind in one eye, they may be seen to have poor depth perception using a test like the stereo fly, Randot, or simply trying to watch a 3D movie. They have lost a component of depth perception and have lost the 3D aspect of a 3D movie. But they can tell you if they are looking at something in 3D like a live picture or a photograph. They can do this via **parallax**, where something close to them moves differently in relationship to something far away. If you have ever been in a moving car at night and it looks like the moon is following you; that is due to parallax. Humans know that something that appears to move more than something else, is likely to be closer. Only one eye is needed to perceive parallax.

For size estimation to perceive depth or distance we can see how that works and goes awry with the Ames Room. The classic Ames room image has people in what looks like a square room, but their sizes are distorted. The distortion comes because we assume people are a certain size and that the room is square. The room is not square which gives the illusion of bizarre size changes of the people; see figure. In this figure the people to the left are actually farther away than the people to the right but appear to be in the same plane. Humans use size estimation all the time for the perception of and estimation of distance. Think about how you might catch a ball. You would look at the ball inflight coming at you and it will get bigger. If it gets bigger quickly it is coming at you fast. This size and speed estimation is important for many sports as well as activity of daily living. Think about looking both ways before crossing the street and you see a car. You'll estimate how fast it is traveling by how quickly it's size appears to change while deciding to cross or not to cross.

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The Stereo Fly to assess stereopsis is discussed in this issue (I8V3) in the how to section. It assesses stereopsis using glasses similar to those used to watch 3D movies and

requires both eyes to perceive the apparent depth or 3D aspects of the pictures presented.

When we take the 3 main aspects of how humans perceived depth or see the world in 3D we referenced above examples of when these are important for activities of daily living as well as for sports performance. NVT will absolutely improve these when applied cogently and this has been published (Optom Vis Perf. 2015;3(2):106-15.). Stereopsis and binocular triangulation are improved by doing drills such as the Brock string and near far exercises.

If you are doing NVT with someone and you want them to be better at estimating speed, or distance, or trajectory, the NVT can help with that. For example, consider doing pitch and catch with different sized balls. If the person is used to catching something that is the size of a baseball, try balls that are bigger or smaller. Balls that are a similar size but different weight, the person catching the balls needs to re-assess the trajectory because a lighter ball will slow faster than a heavy ball. Or include Marsden balls where the person is focusing on characters or shapes on the ball and less on the size or trajectory of the ball. You can take this further by doing pitch and catch with balls, batons, hula hoops et cetera. The batons and hula hoops come in different sizes and weights, all of which can add to the complexity of doing the distance, speed, and trajectory calculations.

In conclusion there are ways to train and improve depth perception in humans using NVT principles. As with many aspects of the human body there are backup systems such that if one aspect of perceiving depth (loss of one eye) occurs the other two can often help take over.

“How To” – The Stereo Fly

The Stereo Fly is traditional optometric tool used to quantify the strength of one’s depth perception. This tool uses the image of a standard fly, paired with 3-dimensional glasses, that when worn and looking at the image of the fly, it pops out towards you. Given that the image of the fly is essentially a central black “mass”, with two translucent wings, it is an ideal stereoscopic subject. To quantify one’s depth perception using the Stereo Fly, please follow the proceeding protocol that we use as part of our neuro-cognitive baseline on the University of Cincinnati athletes:

1. Instruct the participant to sit comfortably and hold the Stereo Fly booklet a comfortable distance away from their face, as if they were to read a standard book.
2. After the participant has gotten into a comfortable position, place the 3-dimensional glasses on them, and ask if they notice whether any aspect of the fly image is protruding out from the page.
    a. If not, this may indicate that the brain is only “using” one eye, and the participant may be experiencing suppression.

3. If the participant notices the fly protruding out from the page, have them take the point of a pen/pencil/pointer and touch it to the tip of one of the fly's wings that they are perceiving in space.
    a. NOTE: "tip of the wing they are perceiving in space" means that when the participant is wearing the 3-dimensional glasses, the fly should be protruding. If the wing is protruding from the page, and the participant is touching the tip of the wing with the pointer, it should be touching it out in space, not on the page, unless the participant cannot actually perceive the wing in space (3-dimensionally).
4. Once the participant has touched the tip of their pointer to the tip of the fly's wing in space, record the distance and label which wing was measured.
5. After completing one of the wings, repeat the above steps 3 & 4 on the other wing that was not previously recorded.
    a. Based on the layout of the Stereo Fly, one of the fly's wings should be perceived approximately double the distance away from the page as the other wing. That is normal.

Of importance, if for some reason, the participant only perceives the fly as flat, without any protrusions, then it is likely that the mind is only using the visual information from one eye, potentially indicating suppression. Consider referring to an eye care professional. If both eyes are functioning properly, the response of the individual would indicate that they are in fact seeing a 3-dimensional image.

Announcements.

Congratulations to Dr. Joe Clark et al for the recent publication entitled, "Survey of Prevention and Intervention Strategies Reducing Return to Play Post-Concussion in Division 1 Football"!

Please check it out at using the following link: https://nsuworks.nova.edu/neurosports/. This peer-reviewed paper was authored by some of the members of our Friends of NVT team and more! It presents evidence that including NVT as part of a rehab program following sports-related concussion can accelerate return to play.

In other news, both Inneuractive and Dynavision International have scheduled to be at the live and in-person International Symposium on Clinical Neuroscience (ISCN) hosted by The Carrick Institute from May 28, 2021 until May 30, 2021. For more information, please explore the following link: https://carrickinstitute.com/event/2021-international-symposium-on-clinical-neuroscience/

Also, we would like all of our readers to know that this concludes our 3rd Volume of the Friends of NVT Newsletter. We greatly appreciate all of your time, support, and viewership! Without the continued support from our readers, we wouldn't be able to

continue on with this important endeavor. Although Volume 3 has concluded, Volume 4 is scheduled to start back up with the release of Issue 1 on Thursday, February 18.

If you have suggestions, recommendations for topics, questions about previous issues, other interests in the realm of NVT please let us know by either reaching out to Dr. Joe Clark (clarkjf@gmail.com), or to Inneuractive directly (info@inneuractive.com). We are honored to your source for Neuro-Visual Training news and information and are committed to providing you with even more leading-edge thoughts and methodologies.

As always, please feel free to visit www.inneuractive.com for more information on NVT, available NVT products, and NVT services.

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