FRIENDS OF NEUROVISUAL TRAINING NEWSLETTER. ISSUE 1, VOLUME 2.

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Introduction.

Welcome back! This is the launch Issue 1, Volume 2 of Friends of NVT Newsletter. We appreciate all of the support and feedback we received with our Volume 1 of this newsletter. Our launch of Volume 2 corresponds to the beginning of the University of Cincinnati football season which starts on Saturday, September 19th. Good luck to the Cincinnati Bearcats facing Austin Peay at 12:00pm EST and can viewed on ESPN+.

The feature article is by Jon Vincent and it is a discussion on Gaze Stabilization, highlighting a recent publication, “Gaze stability in young adults with previous concussion history”, by Silva, et al.

Our “How To” this week is a discussion of what we consider a foundation method; Marsden balls and pitch and catch. This is a fun and highly versatile method that helps get an athlete engaged and working the eye-brain-hand axis.

We also have many important announcements this week! So please check them out at the bottom of this newsletter after reading the NVT content and “How To” sections.

Gaze Stabilization & Literature Review.

I would like to begin by asking you to continuously rotate your head from left to right and back while trying to maintain steadily reading this article. If you were able to do this, you were able to effectively engage a neurologic process known as “gaze stabilization”. The vestibulo-ocular reflex (VOR) is a neurological reflex known to assist in stabilizing images on the retina during head movement, commonly referred to as gaze stabilization. This reflex requires a fair amount of eye discipline – keeping your eyes/vision fixed where you want them to be fixed – but for the sake of this content, we will be focusing primarily on the general realm of gaze stabilization.

Within sports, gaze stabilization is frequently used by a variety of different players, especially when running or moving not only their heads, but their bodies as well. For

example, after a baseball batter has hit a baseball and they begin running towards first base, the player is instructed to not watch the ball and maintain looking at first base. During a full out sprint, one's head inevitably "bobbles" to some degree, yet their vision is still fixated on first base. Or a wide receiver staring at the football being thrown at him in midflight, flipping their hips to get in a better position, forcing them to change their head position, but invariably maintaining their fixed vision on the ball throughout the entire location to catch. These examples illustrate a few instances of gaze stabilization within sports. It is important to maintain the precision of this reflex as visual acuity has shown to decline if eye movements are unable to compensate for changes in head movements. Also, as with our theme across the Friends of NeuroVisual Training Newsletter content, gaze stabilization with the proper NVT methods and exercises, is trainable and will be highlighted in an upcoming "How To" section in a future Issue.

With respect to an unfortunate injury, gaze stabilization has been shown to be a possible neurologic process that can become impaired when a concussion has been incurred. Common symptoms related to gaze stabilization or VOR disfunction primarily manifests as headaches related to mismatched visual-balance processes, as well as general balance/coordination disfunction.

Turning to the literature, a paper recently published in the *Journal of Vestibular Research*, "Gaze stability in young adults with previous concussion history", by Silva et al, explores gaze stability in the chronic stage 1-year post-concussive injury as well as gaze stabilization in relationship to sleep patterns/quality. This research included 34 adults between the ages of 23.35 +/- 1.3 years (17 subjects having incurred 1-9 concussions within 2.5 to 6.3 years and 17 subjects as age and sex matched controls) and investigated three primary outcome measures based on the research objectives including, (1) gaze stability in logMAR (mean loss of dynamic visual acuity, DVA, in the yaw and pitch planes), (2) Pittsburgh Sleep Quality Index (PSQI), and (3) Epworth Sleepiness Scale (ESS).

After obtaining the scores for the above three outcome measures for their 34 research subjects, they found that there was a significant decrease in dynamic visual acuity in the concussion group vs the control group with a p-value of 0.04. Furthermore, within the concussion group, these subjects' dynamic visual acuity scores were significantly correlated to poorer sleep scores. These results are significant because it shows yet another symptom elicited from a concussive injury that has not recovered even 1-year post-injury.

This brings about an important point into further understanding and investigating prolonged symptoms post-concussion as well as calling into question the lack of effective rehabilitative methodologies for these prolonged symptoms. Thus, it is our goal to help bring these to the forefront of the concussion conversation.

Future studies on post-concussion patients who have been treated with NVT during their symptoms laden phase post injury to assess residual VOR deficiencies are needed. We suggest that perhaps the long-term deficiencies observed in Silva's paper are because

those patients may not have had adequate VOR or NVT rehab when they needed it leaving deficiencies to remain.

“How To” – Pitch & Catch with Marsden Ball & Ball-Pit Balls.

Being able to catch a ball is a fairly common but high-level skill for hand eye coordination, containing many underlying neurological processes. In many sports, tracking, hitting, and catching balls can be a central component to their craft as an athlete. For neuro-visual training, we train and improve upon that skill with activities such as the Marsden ball using our Marsden ball NVT methods. Our goal is to engage the athlete or participant’s brain when trying to catch balls, or in other words, making the participant “think” while performing the central task of catching balls. This is achieved by adding colors to the balls (play-pin/ball-pit balls) as well as shapes or alphanumerics to the balls (Marsden balls). While the ball pit balls and Marsden balls can be done separately, we will be discussing how to do the tasks in combination because that is a goal with the progression of this task.

The Balls:
We use standard ball pit balls of multiple colors; red, green, blue, and yellow. Additional colors are fine. In addition to the ball-pit balls we use whiffle balls that are white and add colored shapes or alpha numerics to them. Our default is to put red, green or blue shapes on the balls. The shapes are; square, circle and triangle. Sometimes we put shapes on the ball pit balls. For training purposes, we tend to have about 40 balls with a mixture of the afore mentioned balls such that the subject gets a mixture of colors, shapes and types of balls. The instructions are generally to do 1, 2 or 3 boxes of balls as part of a training session. Marsden ball are easy to make and can be purchased from vendors.

Instructions for the Participant:
The ultimate goal is for the subject to be able to do the tasks with the following instructions, however, we will generally start off slowly with simpler instructions as suggested later. With the ball pit balls note the color in the air and catch the balls with right hand for red balls, left hand for green balls, both hands for blue or black balls and any hand for all other colors. For the whiffle balls note the color of the shape and catch just like you would with the ball pit balls (red = right, green = left, blue or black = both) AND call the shape on the ball while in the air. If you do not have time to call the shape in the air, catch it and without looking at the ball, call the shape.

To get acclimated to the drill we will have a person just do the ball pit balls. No shapes, just catch with the right hand. Then we might have them do the Marsden balls and call the shape in the air, but catch with any hand. As they build proficiency we add complexity

and diversity of the balls. Eventually we want the subject to be able to catch ball pit balls and Marsden balls following the above instructions.

Instructions for the "Pitcher":

This is a drill where the person administering the drill, the pitcher, must be proficient in the pitch. The pitcher must throw "knuckle-balls" with the Marsden balls, so the shape can be read in the air. So the ball must have little to no spin. The pitcher should also hide the ball until throwing. We suggest that you throw the ball from a box or out of a glove. If the subject sees the ball before it is in the air the benefit of the drill is lost. This takes practice on the side of the pitcher.

Implementing the Marsden Ball Drill:

Have a box of balls and an empty box. The pitcher is about 25 feet from the person catching. The pitcher holds the box and throws "knuckle-balls" directly from the box. The catcher catches according to the instructions and drops the balls in the empty box. The pitcher reinforces correct actions and corrects incorrect actions. The pitcher should throw with differing trajectories. Remember the catcher often will have two actions; catch with the right hands and call the correct shape. We tend to not score, but if a person goes through a whole box with no errors, that is noted and reinforced. It is also a queue to progress the drill.

Progressing the Marsden Ball Drill:

One can progress this drill by throwing the balls in a faster sequence. Throw as soon as the catch is made. Adding colors and shapes to the Marsden balls. We've added crosses, letters, numbers, symbols. Sometimes these are added with colored tape or markers. We can have two pitchers such that the catcher needs to see who is throwing and respond to them. The drill can be done on an unstable surface such as half bosu or aerex. One could also add footwork using agility trainers or Zoids. Adding a bounceable ball, such as the vector ball to this drill is an option as well. We've had people perform the drill while bouncing on a mini-tramp.

Goals and Science Behind the Drill:

The goal behind this drill is to get people to think while having to catch a ball. Thinking with stuff coming at you is a very difficult task. This is a true dual task training modality; catching is task one, thinking is task two. An additional benefit to this task is that it forces a person to be less one arm dominant by activating the contralateral motor cortex and engaging mirror neurons. Concentrating on the catch is important but being aware of one's surroundings and keeping the brain engaged is critical to many athletic crafts. This drill can train the brain to be engaged during the catch. Most of our athletes and subjects

consider this to be a very fun drill. When performed in groups it becomes competitive to see who has the fewest drops.

Announcements.

The University of Cincinnati has its first game of 2020 this Saturday, September 19th 2020 at 12:00pm EST in the historic Nippert Stadium, when they take on visiting Austin Peay It can be viewed on ESPN+. We at Friends of NVT are extremely excited for the teams. There will be limited fans in the stands.

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.

Also, we'd like to shoutout a recent publication from Duke University, "Duke Health researchers figure out how to improve athletes' batting performance. The article can be found using the following link:

https://www.wraltechwire.com/2020/07/22/duke-health-researchers-figure-out-how-to-improve-athletes-batting-performance/

It is a great article that furthers the research of Dr. Joe Clark with his 2012 publication in the *PLoS ONE*, "High-Performance Vision Training Improves Batting Statistics for the University of Cincinnati Baseball Players". This publication can be viewed with the following link:

https://pubmed.ncbi.nlm.nih.gov/22276103/

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