

FRIENDS OF NEUROVISUAL TRAINING NEWSLETTER. ISSUE 6, VOLUME 3.

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Introduction.

Welcome to Issue 6, Volume 3 of the Friends of NeuroVisual Training Newsletter! Throughout various issues so far, we have briefly touched on the importance of accommodation and convergence for various activities and how different drills can be used to target these processes. In this issue you will find an in-depth discussion on the importance of the accommodative process for athletic performance.

To continue with the discussion, this week's "How-To" section presents a common test we use to analyze a patient's control of their oculomotor muscles and therefore convergence of their eyes. The Near Point of Convergence assessment can be a great tool to document the absence of suspicion of injury

As always, thank you for your continued support of NeuroVisual Training and be sure to follow us on Twitter @FriendsofNVT!

The Accommodative Process and Athletic Performance

Due to many advances within the athletic training and performance enhancement industry over the past few decades, sports are continually being played at a faster pace as athletes become bigger, stronger, faster, and also... smarter! The ability to quickly shift one's focus from other fast-moving individuals to a high-speed object (ball, puck, etc.) and back again hundreds of times within an athletic competition or practice is becoming more difficult as the speed of games increases. However, as the difficulty increases so does the importance of this skill for athletes to reach and maintain their level of athletic performance.

To further illustrate this aspect of sports, let's think about the neurovisual requirements of a soccer goalie. As they maintain their position in the goal, they must be well aware of the current position of the ball, as well as frequently checking the location of the offensive opponents to know if they are within striking distance shall the ball get passed to them.

Due to there being multiple visual cues of high importance, the goalie must be able to quickly shift their attention from cue to cue all over the field and at various depths. Most importantly, shall the opponent suddenly take a shot and the ball is rapidly approaching the net, they must quickly shift their attention to the ball and be able to quickly gain focus of its trajectory. Some of the toughest shots to defend in soccer are those with a curved trajectory towards the net. However, many times goalies are able to quickly recognize and predict the direction of the ball based on the spin of the ball while traveling towards them. In order for an individual to be able to recognize this spin they must be able to quickly gain and maintain a clear, focused image of the ball as it rapidly approaches them. This “reflex” that allows individuals to quickly shift and gain focus at various depths on multiple objects (or as an object approaches them) is referred to as the accommodation reflex.

The accommodation reflex can be described as an automatic coordinated reflex of the eyes when switching focus from an object that’s far to one that’s closer, or vice versa. The reflex involves three main processes; convergence of the eyes, pupillary constriction, and lens accommodation. For the purpose of this article, we will focus our attention on convergence and accommodation.

Convergence is the process of both eyes simultaneously moving inward when viewing a near object. This adduction alters the visual angle of the eyes in attempts to maintain single binocular vision. The objective of convergence is keeping the object of interest centered on the fovea (the part of the retina with the highest visual acuity). To help visualize this process, hold your finger in front of your nose at a full arm’s length and, while tracking the tip of your finger with your eyes, slowly begin to move it closer to your nose. As your finger gets closer, your eyes will orient themselves at an inward angle in order to keep the finger in focus, this is known as convergence.

While some of the neurophysiology and anatomy of lens accommodation has been discussed in a previous issue (I6V1), it is important to remember that lens accommodation refers to the lens changing shape in order to refract light at different angles to allow the eyes to focus on and maintain a clear image of objects at various distances. When looking at an object off in the distance, the ciliary muscles relax, and the lens is stretched flat. In contrast, when looking at an object close to you, the ciliary muscles contract and as a result the lens relaxes and becomes rounder.

A poor accommodation reflex can be a result of deficiencies in any of the three aforementioned processes and can result in decreased performance on the field, as well as a heightened safety risk in everyday life. For example, as discussed in I5V3, a large amount of time on a cell phone leads to over-convergence and possibly result in orienting an individual’s eyes in a more “eso” position. As a result, an athlete’s peripheral field would be restricted, and they would struggle to quickly shift their focus of various objects back and forth across a field of play. Poor convergence or accommodation would also affect the rate at which an athlete is able to process visual information about an object coming at him. As a result of poor accommodation, the rate at which visual input is received and electrical signals are sent from the retina to the occipital lobe are slowed,

therefore slowing down the processing of the visual information. This often leads to a delayed reaction in an athlete and can be the difference in a wide receiver recognizing the ball in the air with enough time to put his body in position to make a catch or the ball slipping through his hands for an incomplete pass.

While the accommodative process is an unconscious neurological reflex, it can still be trained using many of the NVT tools we have discussed in previous issues! The objective of accommodation and convergence training is to engage your athlete or patient in situations where they are forced to focus on objects at various distances. By doing this we are targeting the eye adductors and abductors and training them to respond quickly and more accurately. Two great drills for this is the brock string and near/far. However, while these are great drills for eye movement (Pillar 1, I1V1), they do not address the neurological aspect of processing the information. It is equally, if not more important to train our brains to be able to think and respond while accommodating. For many patients the issue may not be accommodation itself, but rather the incapability to efficiently process information and multitask while accommodating. Adding word finding to near/far saccades or Marsden balls can be great progressions to begin to incorporate Pillar 3 into your accommodation training.

As sports continue to progress and the speed of the game increases, the speed of accommodation needs to increase as does the ability to track objects at various depths in an efficient and effective manner will only become more important. Neurovisual training can be a great tool to train this accommodative process thus allowing athletes to not only play faster, but also smarter.

“How To” – Near Point of Convergence

Near Point of Convergence (NPC) is a traditional convergence assessment commonly used throughout many fields of healthcare. The NPC is the point where the visual axes intersect under the maximum effort of the convergence system. It is a measurement of pursuit convergence. During times of neurological dysfunction, including concussion, there is data that shows an increased NPC, meaning the patient's eyes are not able to converge as closely as they once could, signifying a potential issue with their oculomotor muscles that control the convergence of the eyes, or even possibly dysfunction with the cranial nerves that innervate these oculomotor muscles not allowing them to contract as tightly as pre-injury. NPC is an assessment that can be done as part of a cadre of assessments to confirm a suspicion of concussion, but also can be used as a part of a quick battery of tests to use to confirm and document an absence of suspicion for injury as well. NPC is a quick and reliable convergence assessment that can aid a practitioner with additional information to come up with a diagnosis, but it should never be the only assessment used to make a concussion or TBI diagnosis. Our protocol for NPC is as follows:

1. Near point of convergence is done with a finger, pen, or the pen light with the light is not on.
2. Start by having the pen about 2 feet from the subject's nose at eye level. Bring pen in towards the nose and have the person track the pen.
3. Watch their eyes and ask them to tell you if they see double.
4. The speed of bringing the pen in should be about 2 inches per second.
5. If/when the person reports double vision, cannot track it or you see the eyes stop tracking note the distance from the eyes to the pen.
6. Results are reported in inches.

Announcements.

A recent paper from the Journal of Sports Rehabilitation demonstrates the use of Nike strobe glasses to show interrupted vision challenges balance. This is a great tool for testing VOR in athletes as well as patients. View this paper using the link below. <https://journals.humankinetics.com/view/journals/jsr/30/1/article-p166.xml?content=pdf-6970>.

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