

FRIENDS OF NVT

OFFICIAL NEWSLETTER OF INNEURACTIVE



INTRODUCTION

Welcome to the latest issue of the Friends of NVT Newsletter!

In this edition, we dive into the intersection of neuroscience and sports performance with two exciting features. “Your Brain at Bat” explores how elite hitters rely on speed of accommodation and processing speed to master split-second decisions at the plate. Learn how the Hercules System’s SoAP application simulates game scenarios to sharpen these critical skills and elevate performance.

We also tackle the challenges of “Why 2D Train in a 3D World?” by examining the limitations of VR and other 2D brain training tools. Discover how integrating 3D NVT activates the brain and vision in ways 2D systems can’t, creating a comprehensive approach to performance enhancement.

Whether you’re a coach, athlete, or performance specialist, this issue offers powerful tools and insights to help you reach new levels of success with NVT!

For more resources, visit [Inneuractive](https://www.inneuractive.com).

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Your Brain at Bat

Baseball hitting is considered one of the most challenging feats in all sports. A batter has just 0.06 - .1 seconds to interpret the spin, trajectory, and velocity of a pitch, then convert that visual information into motor action. Achieving this feat requires exceptional coordination between the brain, eyes, and muscles. Central to this process are two critical visual and cognitive functions: speed of accommodation and processing speed.

Speed of accommodation refers to the lens's ability to shift focus between objects at varying distances—such as transitioning from the pitcher's hand to the approaching ball. Processing speed, on the other hand, is the brain's capacity to interpret visual stimuli after adjusting focus and make rapid, accurate decisions. Together, these faculties enable elite hitters to predict and react to the ball's movement, optimize swing timing, and increase the likelihood of making solid contact with the ball.

This article explores the intricate science behind these processes, their neurological foundations, their role in elite batting performance, and how targeted training can enhance performance at the plate. By bridging neuroscience and baseball, we at Inneuractive aim to show how advancing these skills can help any athlete reach their full potential.

Understanding Speed of Accommodation

To see clearly at different distances, your eyes rely on tiny muscles called ciliary muscles. These muscles adjust the shape of the lens in your eye to focus on what you're looking at. This process is controlled by signals sent from the brain through the oculomotor nerve. The speed at which these ciliary muscles work varies among baseball players, making it crucial to measure and train them—especially for hitters looking to improve their performance.

However, having fast ciliary muscles alone isn't enough to make you a great hitter. The brain must process the visual information the eye picks up, and this process also takes time.

When tracking objects at different depths and distances, the retina sends signals to the brain's visual processing areas. These areas work like a communication highway, ensuring that your brain understands where objects are and how far away, they are. But in baseball, the ball isn't stationary. A pitch constantly changes in speed, spin, and trajectory, forcing the batter's brain to process and react within milliseconds.

The brain area responsible for tracking moving objects is the dorsal visual stream. This part of the brain collaborates with your eyes to keep the ball in sharp focus as it speeds toward you. If the ciliary muscles can't keep up with the rapid change in focus, the image blurs, compromising the brain's ability to act on critical visual information. This highlights the importance of training the accommodation system in the eyes.

Processing Speed

The brain processes visual information through a sophisticated system involving multiple regions. When you see a baseball coming toward you, your eyes send signals to the thalamus and visual cortex, which begin processing these signals. These areas quickly determine the type of pitch being thrown.

From there, the dorsal visual stream calculates the ball's path and helps prepare your body to respond by estimating when and where to swing. At the same time, the frontal cortex evaluates your swing options—whether to hold back, adjust your stance, or swing through. This intricate system gives elite hitters the ability to react with precision.

For these processes to work seamlessly, the visual cortex, dorsal stream, frontal cortex, and motor cortex must operate in harmony and at speed. Most of these skills are traditionally trained through repetition, such as batting practice, but this can lead to unnecessary wear and tear on the body.

Just as practicing your swing improves muscle memory, training your eyes and brain—specifically in areas like accommodation and processing speed—can help you react to visual information faster and more accurately. Tools like light boards and the Hercules System's Speed of Accommodation and Processing (SoAP) application are designed to rewire the brain to enhance these skills.

How SoAP Works

The SoAP application uses two display screens and an Xbox controller. The system can be used wired or wirelessly and integrates into space like no other training system on the market. By positioning one screen 50+ feet away from the athlete and another at the contact point of a pitch, you can simulate an actual hitting scenario that exercises the accommodative process in a game-like environment.

On either screen, a letter, number, or symbol appears. The athlete must use the controller to input which screen they see the content on and then identify the content itself. This trinary decision-making process mirrors what happens during a pitch, activating all the key neuro-visual and motor networks used in the game.

The application includes customizable features, such as portable display monitors for flexible training set ups, adjustable flash speeds, contrast levels, and font sizes, allowing athletes to tailor their training. SoAP also provides quantitative data, enabling users to measure, track, and improve these critical skills.

Bridge Science and Performance

By training reaction speed and accuracy at different depths, SoAP creates real-world scenarios that develop sport-specific visual and cognitive skills necessary for peak performance. Whether it's reading the spin of a baseball or reacting to a defender's move, the ability to bridge perception and action with speed and precision is a game changer.

With training methods rooted in neuroscience, Inneuractive empowers athletes to keep pace with the demands of their sport—and excel beyond them. Explore cutting-edge tools like SoAP to elevate your performance and transform split-second decisions into moments of mastery.

Why Train 2D for a 3D World?

For athletes participating in field and court sports, their training includes physical fitness, strength, and coordination, as well as an increased awareness of incorporating NeuroVisual Training. There are more and more companies and devices being marketed to such athletes that utilize media—computer-based, virtual reality (VR), and/or augmented reality (AR). However, those training aids are generally 2D heavy. While 2D training aids like these have some benefits for cognitive training, their ability to train for a 3D world is limited. Thus, it is important for these athletes to include 3D training in their performance enhancement programs.

What are the pitfalls of 2D training for a 3D world? Simply put, most of these media-based training aids do not engage the accommodative systems or the vergence systems. The eyes and brain are not working together to focus on a point and have the eyes converge at the same point. In the 3D world, the brain and eyes perform numerous calculations to align the distance for accommodation (focusing the eyes) and the convergence of the eyes at the same distance. The state of today's technology is not capable of training those calculations. Thus, these training aids maintain the focal length and the convergence point at the same distance all the time. The result is that the brain becomes accustomed to not changing focus or vergence distances.

We do not have a preference for or against computer-based training, VR-based training, or AR-based training. Each has strengths and weaknesses. For example, computer-based media for training is easy to use but is not wearable. VR is convenient and wearable but lacks accommodation or vergence training. AR is also convenient and wearable but has limited accommodation and is generally more expensive compared to the others.

To avoid detraining the accommodative and vergence systems, it is increasingly important to include 3D training, as we recommend with NVT. Coupling some 2D training modalities with 3D-based NVT creates a stronger training program for the competitive athlete. We are not aware of any peer-reviewed publications that discuss recommended doses for 3D training coupled with 2D training. Notwithstanding, we recommend that 2D training account for no more than 15% of brain training. Also, please note that 2D training is not vision training but rather brain training. Our brand of NVT is a hybrid of brain training and vision training. The 2D training tends to focus on brain training, as the accommodative and vergence systems are significantly underutilized.

In conclusion, media or computer-based training aids, VR, and AR have some benefits for performance enhancement training, though with limitations. When considering these, complement the training with NVT-based 3D training as appropriate for the athlete's craft.

Announcements

Members of the NVT newsletter editorial board and Inneuractive will be at the American Baseball Coaches Association meeting on Jan 2, 3 and 4. Stop by Inneuractive's booth to see some of the latest technologies in NVT, including SOAP as discussed in this issue.

Some of our upcoming issues will have articles about the Hercules system: <https://www.youtube.com/watch?v=lbu5pBsduY0>. Check out the video to learn more and to be more informed about Hercules' reaction time and split attention exercises.

We encourage our Friends of NeuroVisual Training community to engage with these enriching resources. Your commitment to staying updated fuels the advancement of our field, and for that, we are sincerely appreciative.

Disclaimer: Nothing in this communication should be construed as a practice of medicine, an endorsement, or political action. The opinions are the opinions of the authors.