

# **FRIENDS OF NEUROVISUAL TRAINING NEWSLETTER.**

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### **Introduction.**

In this issue of the Friends of Neurovisual Training Newsletter we discuss the topic of computer based NVT. While computer-based training can serve great benefits to a program, be sure not to neglect the other aspects of neurovisual training. Dr. Joe Clark discusses how to address the deficiencies associated with a computer-based program to help your client achieve the best possible results.

The “How-To” section this week describes our twist on the traditional Stroop Color and Word Test (SCWT), which we call Stroop Saccades. Stroop Saccades are a great way to exercise multiple higher-level functions involving the frontal lobe of the brain, along with memory and oculomotor training.

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

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### **Computer Based NVT: The Good, the Bad, and the Third Dimension**

For many individuals, when they hear the term “vision training” the first thing to come to mind are computer-based programs. A few of these common computer programs are Senaptec, RightEye, Fusion Sport, Lumosity, and Elevate. While all of these programs tend to have nice fonts, great graphics, and are visual stimulating to keep the client engaged, they also all have another thing in common; two dimensions. Their training tends to be on a flat surface with minimal change in distance, minimal accommodation, minimal divergence, and minimal need for binocularity. Several of these platforms have solid brain training imbedded within their program so they manage to cover much of the third pillar of NVT, brain training (See FoNVT I1V1). Occasionally they will cover speed of visual processing, multi object tracking, contrast sensitivity, tracking, memory, and reasoning. However, they often lack peripheral vision, speed and distance

estimation, parallaxes, size estimation, and situational awareness as well as an immersive environment from lack of tactile feedback.

Recently brain training for sports performance enhancement was criticized in a review article; <https://www.frontiersin.org/articles/10.3389/fpsyg.2018.02468/full>. The authors questioned and doubted that “brain training” transferred to on-field/on-court performance. They claimed that the “brain training” modalities lacked the environmental stimulation needed to transfer to a dynamic sporting environment. Based on the review of the authors, their premise may have merit, but they lacked a cogent argument to explain why they made their conclusions or how to fix the deficiency. While it may indeed be more efficacious to perform brain training in a sport like environment for the sake of the brain training, this may not always be feasible. If you are in a sport like hockey where you cannot get on the ice all the time it is essential to train off ice. Moreover, the biggest deficiency we at FoNVT feel is made with the brain training modalities reviewed in the afore referenced paper is that they did brain training exclusively on computer screens. This is very far from most sporting venues, short of e-sports. If you have been following the FoNVT newsletter, we started the newsletter with the Three Pillars of NVT (Issue 1, Volume 1), which involve multi modal, multi situational brain training. While this includes computer-based training, it includes many other realms of training as well.

A strength of computer-based brain training is that it can be done almost anywhere. Give the program to an athlete and they can do it at home or during away games. It often can keep score and trainers can get updates on compliance and performance. Those are great attributes which often serve as the key selling points for their vendors. However, the often-overlooked limitation to computer-based training is the two dimensions thus resulting in a small visual field, over converging, and lack of whole-body involvement. Let's address these limitations and how FoNVT oriented training mitigates these.

First, the computer screen is two dimensions and we live in a three-dimensional world. The two dimensions of the computer training means the eyes are not changing focus to do the tasks at hand. Many sports require the athlete to look near and far and activate their accommodative muscles. Modern athletes already spend too much time on media. When coupled with the computer-based training these two things may make their far vision worse! We have personal experience where high caliber athletes complain of a substantial fall in performance associated with time on media. On the bright side, we can reverse that fall by restricting media use and training the accommodative system to do more work at distance. While completely eliminating all screen based activities may seem unfeasible, we are able to mitigate these issues and train away from the over-accommodation problem by doing exercises such as Brock string, near far, yoked prisms, pitch and catch, Marsden balls, and speed of accommodation training (SoA). The SoA training is a computer program, however, uses two screens at different distance. Therefore, we can do the brain training and prevent the over-accommodating.

As mentioned earlier, computer screens drastically limit the individual's visual field which creates huge problems for athletes patiating in sports requiring use of their peripheral vision. Basketball, soccer, football, rugby, hockey, and many others are all

sports that need good peripherals. Too much time on a computer will also decrease peripheral awareness. Decreased peripheral awareness will not only decrease performance but also increase injury risk in many sports. This is mitigated with NVT training such as flash cards from the peripheral, peripheral eye charts (these will be discussed in a future FoNVT issue), multi person Marsden ball or wacky ball, two baton or hula hoop drills, and on field work.

The two-dimensional aspect of computer-based training also does not consider depth perception and often results in over convergence. Over converging is when the eyes tend to want to adduct or converge. They naturally do this when focusing on an up-close object, like a computer screen. Over converging will decrease depth perception, decrease peripheral vision, and make it harder to be field aware. To some extent, the over converging and close accommodation work together in a negative way for field sports as the brain is trained to keep the eyes up close. A good way to prevent over converging is to do drills that require the eyes to abduct, especially at a distance. Drills like scanning saccades, pitch and catch, multi person pitch and catch, two color glasses to keep both eyes working, two baton or hula hoop drills, as well as scanning drills on field are ways to mitigate over converging.

Finally, there is a limited amount of sports-oriented brain training that one can do while sitting in front of a computer screen. We wish to emphasize that computer training has a place, but so does brain training while moving. We do drills where the athlete needs to remember things while doing an activity. These can be things like call and recall drills. For example, a person does a 1-minute run on the dynavision hitting buttons (eye hand coordination drill) where 10 words are flashed at them. They call the words during the drill and recall them 1 minute later. Hence the name "call and recall". We will have people do word finding scanning saccades (Issue 2, Volume 2) for one minute, run one lap, and then recall the words and repeat. This can also be done in a head to head competition or timed. It is a great way to get people to remember things while doing multiple activities. We counsel our athletes that this drill helps them remember formations and events that occur during play and have received positive feedback that such drills do transfer to the field. We have heard that the athletes become better "students of the game". We believe this is because they can take in, retain, and use information better on the field. Yes, we believe brain training transfers to the field.

In conclusion, computer-based training has its uses and limitations. Concerning the redress of the title of this article; the good is that brain training is an important part of sports performance. The bad is that the computer training can lead to unintended negative consequences of over converging and over accommodating. The third dimension is that computer training is two dimensional when we live and play in a three-dimensional world. Sports specific brain training is an important avenue for performance enhancement, but there are ways to make NVT relevant to the athlete and their craft that go beyond sitting in front of a computer screen. Always come back to the three pillars of NVT (Issue 1, Volume 1) when doing brain training and/or NVT. Computer training alone is no replacement for dynamic, physical and mental training.

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## “How To” – Stroop Saccades.

The Stroop Color and Word Test (SCWT; Figure 1) is a commonly known neuropsychological test that is used to assess the ability of the participant to inhibit cognitive interference that occurs when processing a specific stimulus feature impedes the simultaneous processing of a second stimulus\*; this is known as the Stroop Effect. For more information regarding the traditional SCWT, please see the below reference at the end of the “How To” section.

RED	BLUE	GREEN	BLACK	GOLD	BLUE	GREEN
BLACK	RED	ORANGE	YELLOW	BLACK	GREEN	YELLOW
GOLD	ORANGE	YELLOW	PINK	BLUE	BLACK	RED
PINK	BLACK	ORANGE	RED	YELLOW	BLUE	GREEN
PURPLE	ORANGE	GREEN	PURPLE	ORANGE	PINK	RED
BLUE	PINK	PURPLE	GREEN	YELLOW	YELLOW	BLACK
RED	GREEN	BLUE	GOLD	YELLOW	ORANGE	BLACK
PINK	YELLOW	GREEN	RED	BLACK	ORANGE	BLUE

Figure 1.

Briefly, to perform this assessment or exercise, traditionally the participant is instructed to read down the columns and read out loud the color of the word, NOT the word itself. The time it takes for the participant to complete the assessment is a quantified measure. Since the word is a word for a different color, this can be surprisingly difficult.

Stroop Saccades are our version of the SCWT but with two twists; (1) the addition of ~10 non-color words that all relate to a specific category, and (2) having the participant read the Stroop sheet in a “saccadic fashion”. They begin by reading the first word of 1<sup>st</sup> column, then the first word of the 10<sup>th</sup> column, then going down the 1<sup>st</sup> and 10<sup>th</sup> columns until the end of the column, then moving in one column so that the participant would now be reading the first word of the 2<sup>nd</sup> column and the first word of the 9<sup>th</sup> column, and so on. The first twist adds a memory component tied with the traditional Stroop Effect frontal lobe training, and the second twist adds oculomotor training from engaging saccadic eye movements.

Figure 2 is an example of our style of Stroop Saccades, which you can see that some of the words are not colors but are city names, although they are still colored themselves. With that said, the major addition with the inclusion of city names instead of color words is that you have the participant read out loud the color of the word (in the above described saccadic fashion), NOT the word itself, THEN once finished, have the participant recall out loud what the non-color words were (in this case, in Figure 2, the

city names). The time it takes to do this exercise or assessment is recorded, along with the number of correctly recalled non-color words.

GREEN	PINK	GOLD	PARIS	ORANGE	ROME	GOLD	RED
GOLD	BERN	GREEN	RED	SOFIA	ORANGE	PINK	YELLOW
BLACK	GREEN	PINK	ORANGE	PURPLE	RED	PURPLE	PRAGUE
VIENNA	YELLOW	ORANGE	PURPLE	YELLOW	DUBLIN	OSLO	PINK
BLUE	ORANGE	BERLIN	RED	GREEN	YELLOW	YELLOW	GOLD
YELLOW	LONDON	PURPLE	BLUE	RED	PURPLE	ORANGE	BLACK
PURPLE	BLUE	BLACK	YELLOW	PINK	ORANGE	GREEN	BLACK
ANKARA	PINK	GREEN	ORANGE	PINK	ATHENS	BLUE	TALLINN

Figure 2.

\*Scarpina F, and Tagini S. The Stroop Color and Word Test. *Front Psychol.* 12 April 2017. <https://doi.org/10.3389/fpsyg.2017.00557>

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## Announcements.

This issue concludes Volume 2 of the Friends of NVT Newsletter. Thank you for all of your support thus far and we are excited to launch Volume 3 on December 3<sup>rd</sup>!

If you are interested in all sorts of brain training, you may wish to register for and attend the virtual Carrick Symposium; The Synapse Sessions – 2020. The virtual sessions are from November 13 to 15<sup>th</sup> from 9:00 AM through to 5:00 PM EST. More information here; <https://carrickinstitute.com/event/synapse-sessions-2020/>.

The International Sports Vision Association has moved their annual conference to a virtual format for 2021. This year's conference will take place February 20<sup>th</sup> and 21<sup>st</sup> and the theme, "Joining Forces to Enhance Athletic Performance", will bring together some of the leading authorities in sports vision assessment and training. For more information please visit <https://www.sportsvision.pro>.

If you are interested in purchasing any NVT products, including the Stroop Saccades, you can visit Inneuractive's store at [www.inneuractive.com/s/shop](http://www.inneuractive.com/s/shop). New products are continuously being added so be sure to check back frequently!

The 7<sup>th</sup> ranked Cincinnati Bearcats face ECU at home this Friday at 7:30 on ESPN2. This will be the Bearcats last home game of the regular season as the seniors look to become the winningest class in UC Football history.

An early advocate of our brand of NVT is Cincinnati Reds Hall of Famer Johnny Bench. He is a co-author on one of our papers from 2012 discussing NVT for baseball batting enhancement. This paper can be found at

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0029109>.

If you are interested in sports memorabilia from Johnny Bench, he is auctioning some of his personal collection this weekend. To view the auction please visit

<https://www.sportscollectorsdaily.com/johnny-bench-auction-louisville-2020/>

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**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.