



- Pitches traveling at 100(70) mph take just 400 ms to travel from the pitcher to the hitter. Since the typical reaction time is 200 ms, and it takes 100 ms to swing the bat, this leaves just 100 ms of observation time on which the hitter can base his swing. If reacting that fast sounds superhuman, it is; if reaction time were all there was to it, batters would never get a hit. To work around their slow reactions, humans have developed a **three-layer mental strategy**.

- Although baseball players' reactions aren't superhuman, as they are sometimes portrayed, the reality sounds just as fictional. Their brains are simply employing a three-layer mental strategy to travel forward in time, determine when and where the ball will cross the plate, and provide precious extra milliseconds to compensate for slow reactions. The truly amazing thing is that each person's brain is naturally equipped with this ability.
- Of course, most of us can't hit a 100 mph fastball. The best hitters spend hours watching thousands of pitches. With each pitch, the different layers in their brains get just a bit better. Maybe the reaction times of these hitters aren't superhuman, but the focus and dedication required to train their brains enough to hit a fastball might be.

# What is Vision Training?

How to Improve Your Athletes  
Sports Vision

- *“Eyesight is simply the ability to see something clearly, the so-called 20/20 eyesight (as measured in a standard eye examination with a Snellen chart). Vision goes beyond eyesight and can best be defined as the understanding of what is seen. Vision involves the ability to take incoming visual information, process that information and obtain meaning from it.”*
- *- Dr. Donald Getz, OD*

- Vision training has little to do with improving eyesight
- It is a form of perceptual learning intended to improve the ability to process what is seen.
- By repeatedly activating the visual sensory neurons, they increase their ability to send electrical signals from one cell to another across connecting synapses.
- With sensory neurons, just like muscles, it's use it or lose it. The more they are used the better they perform.

- As the eyes are responsible for gathering over 2/3rd's of all information fed to the muscular skeletal system, the athlete who focuses on physical conditioning only is neglecting a key component...VISION! The visual system determines where and when to hit, throw and catch a ball, and enables the body to move precisely through three dimensional space.

# Vision Definitions

- **DYNAMIC VISUAL ACUITY**

This is the visual skill that allows you to see objects clearly while the object is in motion. In virtually every sport this means that you need to have exceptionally good vision at distances ranging from a few inches to 300 feet.

- **FOCUSING SKILLS**

The ability to see clearly both up close and in the distance, and to shift focus quickly, accurately and efficiently from near to far

- **SACCADIC EYE MOVEMENT**

The ability to scan quickly from player to player, or ball to target

# Vision Definitions

- **TRACKING**

The ability to follow a moving object smoothly and accurately with both eyes, such as a ball in flight

- **FIXATION**

The ability to quickly and accurately locate and inspect an object with both eyes

- **BINOCULARITY**

The ability to use both eyes together, smoothly, equally, simultaneously and accurately

# Vision Definitions

- **DEPTH PERCEPTION**

The ability to judge relative distances of objects and to see and move precisely in three-dimensional space

- **VISUAL RECOGNITION AND REACTION TIME**

The speed with which your brain interprets and reacts to your opponent's action

- **VISUAL CONCENTRATION**

The ability to screen out distraction and stay focused on the ball or target

# Vision Definitions

- **PERIPHERAL AWARENESS**

The ability to use visual information perceived from over a large area

- **CENTRAL-PERIPHERAL INTEGRATION**

The ability to monitor and interpret what is happening around you while attending to a central, specific task

- **EYE-HAND-BODY-COORDINATION**

These crucial interactions are the ultimate basis of athletic skill. The ability to take in correct and appropriate visual information and translate it into necessary body movements is the essence of this skill set.

# Vision Definitions

- **VISUAL MEMORY**

The ability to process and remember a fast moving, complex picture of people and things

- **VISUALIZATION**

The skill which enables you to see yourself performing well in your "mind's eye" while your eyes are seeing and concentrating on something else

- **DECISION MAKING SKILLS**

The cognitive thought of reaching a decision between alternative courses of action

# Why Vision Training?

- Vision is learned. This makes vision a trainable skill. Almost anyone can be taught the necessary visual skills necessary to excel in sports and life. Plus, it stands to reason that since 75-90% of all learning comes through the visual pathway first, **any interference in the visual system can interfere with reaching your player's ability to reach their maximum potential.**

- “Vision, like other sensory systems, can be improved with practice,” Dr. Sabel said. “The improvements occur not in the optics of the eye, but in the central processing centers of the brain.”
- The growing practice of ‘sports vision training’ relies on the notion that practice with demanding visual perceptual, cognitive, or oculomotor tasks can improve the ability to process and respond to what is seen, thereby improving sport performance.
  - [L. Gregory Appelbaum & Graham Erickson \(2016\): Sports vision training: A review of the state-of-the-art in digital training techniques, International Review of Sport and Exercise Psychology, DOI: 10.1080/1750984X.2016.1266376](#)
- So-called ‘sports vision training’ (SVT) operates under the logic that practice with demanding visual perceptual and oculomotor tasks will improve vision, leading to quicker sensory processing, swifter and more accurate motor movements, and improved athletic performance while also potentially reducing injury (Erickson, 2007).

# Why Vision Training?

- “Vision, like other sensory systems, can be improved with practice,” said Dr. Bernhard Sabel, a neuroscientist at Otto von Guericke University in Magdeburg, Germany, who studies plasticity in the brain. “The improvements occur not in the optics of the eye, but in the central processing centers of the brain.”
- The individual who can process more visual information in a shorter period and make the proper response will have an advantage in competition.
- As athletes tap out their potential in other aspects of their performance, like speed, power or strength, what will they turn to next to increase their performance?

- **The trend seems to be that they will turn to vision training.**

# Does Vision Training Work?

To support the claims made by these training programs we actually need to demonstrate 3 different things:

First, we need to show that the visual abilities that are being trained (whether its acuity or peripheral vision) improve after training in people with already normal vision or above normal vision.

# Does Vision Training Work? P.2

- Second, we need to show that sports performance is improved in some way after the training is done.
- Third, and most importantly, we need to demonstrate transfer of training. In other words, we need to show that the reason people got better at sports by the end of the vision training program was because their vision got better (and not due to some other confounding reason). This will require one or more control conditions.

# Vision Training Study from 2014 - Dept of Psychology – University of North Dakota

- In the growing field of sports vision little is still known about unique attributes of visual processing in ice hockey and what role visual processing plays in the overall athlete's performance. In the present study we evaluated whether visual, perceptual and cognitive/motor variables collected using the Nike SPARQ Sensory Training Station have significant relevance to the real game statistics of 38 Division I collegiate male and female hockey players. The results demonstrated that 69% of variance in the goals made by forwards in 2011–2013 could be predicted by their faster reaction time to a visual stimulus, better visual memory, better visual discrimination and a faster ability to shift focus between near and far objects. Approximately 33% of variance in game points was significantly related to better discrimination among competing visual stimuli. In addition, reaction time to a visual stimulus as well as stereoptic quickness significantly accounted for 24% of variance in the mean duration of the player's penalty time. This is one of the first studies to show that some of the visual skills that state-of-the-art generalized sports vision programs are purported to target may indeed be important for hockey players' actual performance on the ice.

# Vision Studies

- [The Effects of Sports Vision Training on Binocular Vision Function in Female University Athletes](#)
  - Binocular vision is the most important visual cue for spatial orientation in many sports. In this study, we investigated how binocular vision was influenced by an eye training program that may be used to improve individual's oculomotor function.
  - The results of the study suggest that binocular functions are trainable and can be improved by means of appropriate visual training

# Vision Studies

- [Williams et al. \(2002\)](#) trained anticipation of tennis groundstrokes using film-based sport-specific vision (perceptual) training. They demonstrated that anticipation could be trained through video feedback of key visual stimuli from the opponent's action. Not only did anticipation performance improve above that seen in a matched-ability intervention group, but these improvements transferred to an on-court test of anticipation (the training group's mean responses were 0.187 s quicker than reported for the control and placebo groups)

# Stroboscopic Training

- [Stroboscopic Training Enhances Anticipatory Timing - International Journal of Exercise Science 5\(4\) : 344-353, 2012.](#)
  - Recent research has suggested that training in a stroboscopic environment, where visual experiences alternate between visible and obscured, may provide a means of improving attentional and visual abilities.
  - The current study explored whether stroboscopic training could impact anticipatory timing—the ability to predict where a moving stimulus will be at a specific point in time.
  - Compared to the Control group, the Strobe group was significantly more accurate immediately after training, was more likely to respond early than to respond late immediately after training and 10 minutes later, and was more consistent in their timing estimates immediately after training and 10 minutes later.

# More Stroboscopic Training

- [Enhancing Ice Hockey Skills Through Stroboscopic Visual Training - A Pilot Study](#)
  - Recent research has suggested that a new sport training tool may enhance vision, attention, and response timing.
  - The tool, stroboscopic eyewear, includes lenses that alternate between transparent and opaque states to produce stroboscopic visual conditions.
  - Previous research has demonstrated that stroboscopic training can improve visual abilities, but can stroboscopic training affect sport performance directly?
  - The strobe group averaged an 18% improvement in on-ice skill performance from pretraining to posttraining, whereas the control group's performance did not improve
  - The current results demonstrate improvement in the athletic skill of professional athletes with training that added one new component—wearing stroboscopic eyewear—to their normal routines.

# More Stroboscopic Training

- [Stroboscopic visual training improves information encoding in short-term memory](#)
  - **L. Gregory Appelbaum & Matthew S. Cain Julia E. Schroeder & Elise F. Darling & Stephen R. Mitroff**
  - In the present study, a partial-report memory paradigm was used to assess the possible changes in visual memory following training under stroboscopic conditions.
  - In comparison to the control group, both stroboscopic groups (immediate and delayed retest) revealed enhanced retention of information in short-term memory, leading to better recall at longer stimulus-to-cue delays (640–2,560 ms).
  - These results demonstrate that training under stroboscopic conditions has the capacity to enhance some aspects of visual memory, that these faculties generalize beyond the specific tasks that were trained, and that trained improvements can be maintained for at least a day.

# Performance Studies

- A [study](#) by a team of psychologists and published in February in Current Biology showed that baseball players at the University of California, Riverside, were able to improve by 30 percent their reading of eye charts — as well as their batting averages — after completing more than two dozen 25-minute vision training sessions using a computer program. Players who didn't receive the training did not show similar improvement.

# Performance Studies

- A study of the University of Cincinnati baseball team found marked improvement in the batting averages of players following six weeks of various kinds of vision training. The team batting average went up 34 points from the previous season, exceeding improvements of other N.C.A.A. teams. Errors decreased by 15 percent, while fielding assists increased 8 percent. (One author of the study was Johnny Bench, the Hall of Fame catcher.)

# Is There Really any Proof?

- Two types of vision training programs exist, namely, generalized vision training (GVT) and sport-specific vision training (SVT). GVT programmes are designed to improve basic visual function. While there is anecdotal support for the use of GVT programs, there remains a paucity of empirical evidence to suggest that such training improves sports performance. Conversely, research on SVT has been shown to lead to task-specific improvements in sports performance.

# More Proof...

- [Hopwood et al. \(2011\)](#) demonstrated that highly skilled cricket players who received visual-perceptual training in conjunction with on-field training, demonstrated greater improvements in in situ fielding tests (catching success improved by 21.7 % from pre-to post-test) compared to those who received on-field training alone (catching success improved by 16.2 % from pre- to post-test).

# Vision Training & Concussions

- There is emerging evidence supporting the use vision training, including light board training tools, as a concussion baseline and neuro-diagnostic tool and potentially as a supportive component to concussion prevention strategies.
- When vision training is initiated as a team wide exercise, the incidence of concussion decreases in players who participate in training compared to players who do not receive the vision training.
- Vision training produces functional and performance changes that, when monitored, can be used to assess the success of the vision training and can be initiated as part of a sports medical intervention for concussion prevention.

# Summarizing

- Without task-specific knowledge about the salient visual information, the benefits of having more effective general visual functioning in individuals with already healthy visual function are unlikely to be realized.
- SVT has been shown to have performance advantages when compared to control and placebo groups across a range of sports. These advantages appear to be task-specific.

# Questions for Your Players?

- Do you use any visual aid? For competing? For training?
- Do you have difficulty keeping your eye on a moving object?
- Do you notice variations during your performance?
- Does your performance fall off early or late?
- Is your performance the same for night as for day competition?
- Do you have other visual difficulties when performing?
- Do you experience loss of concentration when performing?

# Does The Coach Recognize Any Of The Following Signs?

- Inconsistent performance
- Performance not up to potential
- Performance deteriorates over time
- Performance deteriorates under mental or physical stress?

# Vision Training Tools

- Charts
  - Hart Charts
  - Saccadic Charts
  - Wall Charts
  - Peripheral Vision Charts
  - Rings
  - Contrast Sensitivity
  - Peripheral Vision
  - Fusion Cards

# Vision Training Tools

- Brock String
- Eye Patch
- Strobe Vision Goggles
- Cognitive Vision Program
- Senaptec App
- SOR – Speed of Recognition Stick
- Super Tach Program

# Vision Training Tools

- Vision Rings
- Juggle Stick
- Flat Bat
- Small target balls and bats
  - Wiffle Golf Balls
  - VTU Stick
  - HTS Home Training Package
  - FIND MORE at [Howell to Sports](#)

# In Conclusion

- Vision is the process of reacting to what one sees
- Vision is one of the basic sports ingredients for winning
- The eyes manage the body. They orchestrate the motor muscular movements of the body
- The visual system is the trigger mechanism which determines the right time
- The eyes look where we tell them to look – they are teachable