

# Introduction to Sports Vision Training – Foundational, Cutting Edge, and Just Plain Fun Techniques

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## Disclosure Statement

- Dr. Horn is a co-founder of [www.sportsvisionpros.com](http://www.sportsvisionpros.com)
  - Editor for Journal of Sports and Performance Vision
  - Dr. Horn has consulted for the following companies:
    - Sanofi Genzyme
    - Nike Vision
- I do not receive any direct or indirect benefits for this presentation



## Today

- There will be a lot of discussion about industry
  - These are not endorsements or commercials
  - The names are shared for information as this is all public knowledge

## Goals Today

1. Understand **ways to train visual tasks** that are relevant for a given sport
2. Understand **ways to increase the difficulty of training**, whether it is based on time, cognitive load, and more
3. Identify the **uses of the newest technology** available in the sports vision training market
4. Consider **how to work alongside colleagues in other professions** (athletic training, strength and conditioning, coaches, etc.)

# Introduction

- Who is an athlete?

# Introduction

- What is sports vision training?
  - Remediate “deficient” visual skills
  - Enhance visual skills

## Pre-Training Assumptions / Recommendations

- Assessment
  - Vision Skills assessed – standard
    - Visual Acuity
    - Contrast
    - Stereo at distance
    - Cover test
  - All in primary care and performance-specific gaze(s)

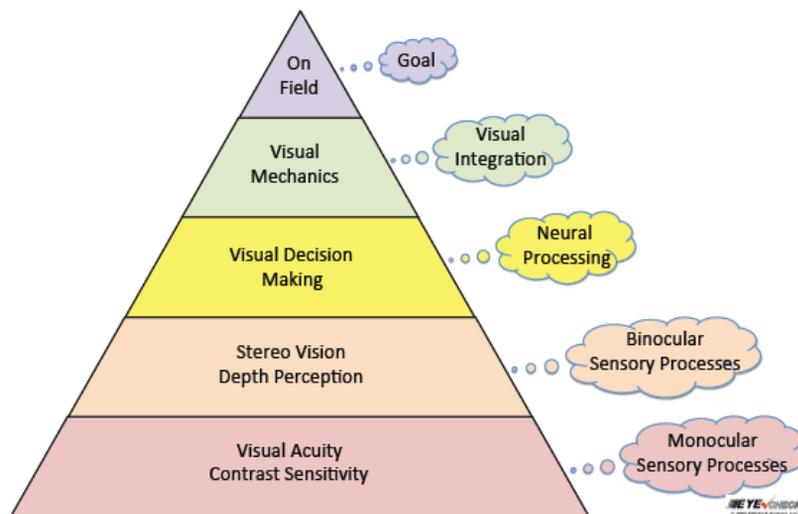
## Pre-Training Assumptions / Recommendations

- Assessment
  - Vision Skills assessed – sport specific
    - Eye – hand / foot / body reaction time
    - Reaction to peripheral targets
    - Balance
    - Accommodative-vergence facility
    - And more depending on the skills necessary for performance

# Visual Analysis

- 2008 American Academy of Optometry in Anaheim, CA<sup>16</sup>
  - Dr. David Kirschen and Dr. Daniel Laby discussed focusing on the “visual fundamentals”
    - Which includes Visual Acuity, Contrast Sensitivity
  - The foundation is based on the monocular components of acuity and contrast
  - The next level is binocular function

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Courtesy of Dr. David Kirschen and Dr. Dan Laby

## Pre-Training Assumptions / Recommendations

- Assessment
  - Refractive Error
    - Assessed to maximize visual acuity and contrast
    - Push patient to maximum visual abilities
    - Prefer to have a chart where you can change the target to decrease memorization

## Pre-Training Assumptions / Recommendations

- Assessment
  - Refractive Error Compensation
    - Contact lenses are preferred method of compensation
      - Depending on sport
    - Prefer daily disposables
    - May slightly over-minus to increase contrast, especially in dusk/night conditions

## Pre-Training Assumptions / Recommendations

- Ocular Health
  - Assess for both anterior and posterior pathology and risk factors
  - Good retinal evaluation, especially for contact sports

## “New” Assessment Technology

- There are a few “all-in-one” sports vision assessment training options that are available today:
  - No particular order – alphabetical, in fact
  - Again, not endorsing, but informing



## SPORTS VISION PERFORMANCE



<http://www.mstech-eyes.com/products/details/sports-vision-performance>



## “New” Assessment Technology

- M & S Technologies – Sports Vision Performance (SVP)
  - Visual Acuity (S & D)
  - Contrast Sensitivity
  - Depth Perception
  - Developmental Eye Movement
  - Eye Alignment
  - Fusional Ability
- Delivered by laptop or via their SmartSystem® Visual Acuity System
- Can compare to database

<http://www.mstech-eyes.com/products/category/sports-vision-performance>





Courtesy of Dr. Keith Smithson

<https://righteye.com/product-overview/>



Functional Vision  
EyeQ



Brain Health  
EyeQ



Reading  
EyeQ



Sports Vision  
EyeQ



EyeQ  
Trainer



## “New” Assessment Technology

- RightEye – Multiple types of assessment options
- For sports vision...
  - Visual Acuity (S&D)
  - Contrast Sensitivity
  - Phoria Measurement
  - Pursuit
  - speed
  - Eye Movement speed
  - Visual Concentration
  - Reaction Time –
    - Simple & Choice
  - Discriminate Reaction Time

<https://righteye.com/sports-vision-eyeq/>





<http://www.senaptec.com/sensorystation/>

## “New” Assessment Technology

- Senaptec Sensory Station
  - Visual Acuity
  - Contrast Sensitivity
  - Depth Perception
  - Near – Far Quickness
  - Target Capture
  - Perception Span
  - Multiple Object Tracking
  - Eye-Hand Coordination
  - Go / No-Go
  - Reaction Time

<http://www.senaptec.com/index.php/products/sensory-station>

## “New” Assessment Technology

- There are others out there
  - VizualEdge
  - OptimEyes
  - And more

## Recent Study

- Performed assessment on the Nike Sensory Station of 252 MLB players
- Found that “sensorimotor abilities predict on-base percentage, walk rate, and strikeout rate, but not slugging percentage or fielder-independent pitching.”

## Recent Study

Visual Skill	Positive Correlation	Notes
Perception Span	On-base percentage Walk rate Strikeout rate	Better in outfielders and older players
Depth Perception	Higher walk rate	
Eye-hand coordination	Higher walk rate	
Reaction times	Higher walk rate	
Near-far quickness	Strikeout rates	
Target Capture	Strikeout rates	
Contrast Sensitivity	Strikeout rates	

Burris K, Vittetoe K, Ramger B, et al. Sensorimotor abilities predict on-field performance in professional baseball. *Scientific Reports* | (2018) 8:116 | DOI:10.1038/s41598-017-18565-7



## Pre-Training Assumptions / Recommendations

- Patient Considerations & Discussion
  - Working with minors
  - Student athlete – NCAA regulations
  - Do **not** guarantee that training will result in better on-field performance



## Pre-Training Assumptions / Recommendations

- Patient Considerations & Discussion
  - What is their motivation for training?
  - In-office vs. integration with athletic practice vs. gym
  - Training vs. coaching

## Visual Training

- Can be used to improve “deficient” visual skills
- Improve their current skills
- Assist with recovery from injury, concussion, TBI, etc.

## Assumptions

- For the rest of this, I assume that the athletes are...
  - Corrected to the best of their visual abilities
  - Motivated to perform visual training

## Vision Training

- Timing of training
- Relate to sport / performance
- Developing an “automaticity of response”
- Train on assessment tools?

# Vision Training

- Loading (from Dr. Graham Erickson's Book)
  - Low stress to high stress
  - Start in isolation and then integrate sensory (balance, auditory)
  - Static to dynamic (athlete or target)
  - Increase cognitive load
  - Elevate beyond a "critical" level

1. Erickson GB. Sports Vision: Vision Care for the Enhancement of Sports Performance. Philadelphia: Butterworth-Heinemann, Elsevier; 2007



# Vision Training

- Loading of training
  - Time
    - Time limit
      - Reduce over time
    - Metronome
      - Makes it an external control they are reacting to
      - Slower may be more difficult for some tasks



## Vision Training

- Loading of training
  - Balance
    - Two legs → one leg → balance boards/apparatus
    - Swiss ball
  - Cognitive
    - Relative to sport → Math → Random trivia



## Vision Training

- Loading of training
  - Split Attention
    - Have them perform an activity while attending to another object
      - Call out a Hart Chart letters while doing eye-hand reaction training
      - Recognizing how many fingers are held up during a reaction drill
  - Visualization



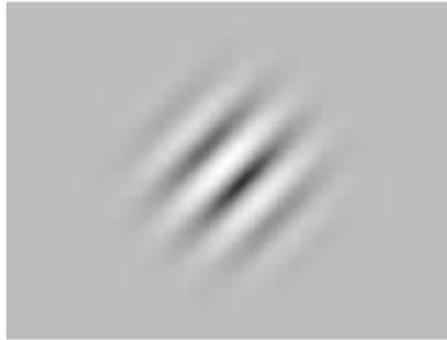
# Let's Look at Visual Skills

## Visual Acuity Training

- Foundational Training
  - Fogging of lenses
    - Bangerter foils, extra plus, etc.
  - Blur interpretation
  - Feedback

## Visual Acuity Training

- Cutting Edge
  - Gabor images
    - Glasses Off
    - Ultimeyes



## Visual Acuity Training Studies

- Israel Air Force
  - Three 12-15 minute sessions a week x 3 months
  - 35% improvement in visual acuity
  - 24% improvement in image processing speed
  - 70% of participants self-reported substantial changes in near vision
  - 60% self-reported improved reaction times

## Visual Acuity Training Studies

- Professional Baseball Players (poster)
  - 11 Athletes already have “superior” visual skills
  - Used GlassesOff App (Gabor patches)
  - Still noticed improvement in..
    - Static VA
    - Dynamic VA
    - Crowded acuity
    - Contrast sensitivity
    - Reaction time

D Cunningham, M Lev, O Yehezkei, et al. The Effects of Perceptual Learning on Visual Processing Functions in Professional Baseball Players. 2016.



## Visual Acuity Training Studies

- UC Riverside Baseball team
  - 19 players
  - 30, 25 minute sessions (each on different day)
    - Gabor patches via Ultimeyes app
  - Control was 18 pitchers
  - 31% improvement in Binocular VA (mean 20/13)
  - Improved contrast sensitivity

J Deveau, D Ozer, A Seitz. Improved vision and on field performance in baseball through perceptual training. Curr. Biol. 2014. 24(4): R146-R147.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3932179/>



## Contrast Sensitivity Training

- Foundational
  - Fogging of lenses
  - Feedback

## Contrast Sensitivity Training

- Cutting Edge
  - Nutrition
    - Supplements containing carotenoids (lutein, zeaxanthin and meso-zeaxanthin) and/or anti-oxidants.
- Macuhealth / Vizionedge
- Zeavision – EyePromise

## Contrast Sensitivity Training

- Cutting Edge
  - Gabor images
    - Influence on reaction time
  - Glasses Off, Ultimeyes

## Contrast Sensitivity Training

- Alternatives
  - For outdoors
    - Tints



<http://global.rakuten.com/en/store/aspo/item/oss-njp-ev0871-010/>

## Eye – Tracking Training

- Foundational
  - Readalyzer / Visagraph
  - Marsden Ball
  - NSUOCO



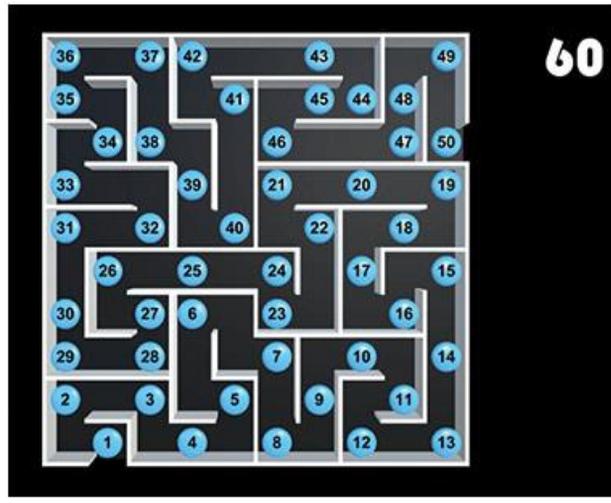
[http://cdn.bernell.com/images/uploads/2852\\_5313\\_large.jpg](http://cdn.bernell.com/images/uploads/2852_5313_large.jpg)

## Eye – Tracking Training

- Cutting Edge
  - Right Eye – Sports Vision Trainer
    - “Sports Vision Trainer makes available easy-to-follow vision exercises to improve coordination, reaction times and more on the field, court and green.”
  - Customized for certain sports

<https://righteye.com/sports-vision-trainer/>

## Right Eye



<https://www.2020mag.com/articles/new-products-0817>



## Eye – Tracking Training

- Cutting Edge
  - Right Eye
  - QuietEye
  - Other portable Eye Tracking systems



# Eye – Hand Reaction Training

- Foundational
  - Integration of Marsden Balls
  - Strobe lights
  - Vision Ring
  - Ball Toss (front, behind, colors, angles)
  - Eye-hand reaction light boards
    - Limited features



Courtesy of Dr. Keith Smithson

# Quick Ball Toss



# Eye – Hand Reaction Training

- Cutting Edge
  - Light boards with additional features
    - Batak
    - Dynavision
    - Sanet Vision Integrator
    - Senaptec Sensory Station
    - SVT
    - Binovi by EyeCarrot
    - Vison Coach

## “Light Boards”



<https://products.dynavisioninternational.com/products/d2>

# “Light Boards”

What is Binovi?



<https://www.eyecarrot.com/binovi-platform/>



<http://www.visioncoachtrainer.com/photos.html>



<http://www.bernell.com/products/WHITE-FUN-BOARD>



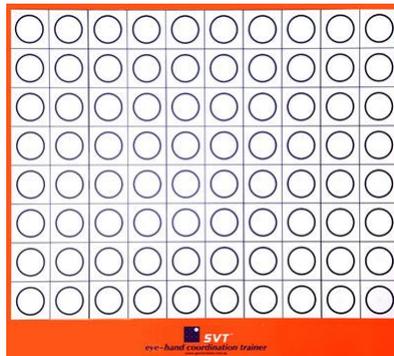
[http://www.education.com/index\\_suba](http://www.education.com/index_suba)

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# “Light Boards”



<https://www.fitlighttraining.com/products/vision-board/>



<http://www.sportsvision.com.au/svt/80-light-system/>



<http://www.batakite.com/>

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## Eye-Hand Reaction Training

- Budget Model
  - One or two laser pointers
    - Two individuals
      - One person faces the wall
      - Other shines laser pointer to where the first person can “hit” the light
      - Then shine the other light
      - Count how many “hits” in a given time

## Eye – Hand Reaction Training

- Cutting Edge
  - Strobe Glasses
    - MJ Impulse
    - Senaptec
    - Vima
  - FitLight

## Eye – Foot Training

- Foundational
  - Accessories for certain light boards
  - Attentional tools
    - Colors, shapes, numbers on balls

## Eye – Foot Training

- Cutting Edge
  - FitLight
  - QuickBoard
  - Strobe Glasses

## Eye – Body Training

- Foundational
  - Accessories for certain light boards
  - Trampoline

## Eye – Body Training

- Cutting Edge
  - FitLight

## Split Attention / Neuroplasticity Training

- Foundational
  - Light Boards with Hart Charts
  - Other in-office activities

## Split Attention / Neuroplasticity Training

- Cutting Edge
  - Neurotracker
  - NeuroTrainer VR
  - Sensory Station
  - Neuro-Vision Rehabilitator System

## Split Attention / Neuroplasticity Training

- Cutting Edge
  - Sanet Vision Integrator
  - Dynavision2
  - Vision Coach

## Split Attention / Neuroplasticity Training

- Cutting Edge
  - Interprofessional interaction

## Peripheral Awareness

- Foundational
  - PATT
  - Hart Chart

## Peripheral Awareness

- Cutting Edge
  - Sensory Station
  - Light Boards
  - FitLight

## Use in Concussion

- University of Cincinnati Studies
  - Utilized D2, Strobes, and tracking drills
  - Training cohort → 1.4 concussions per 100 player seasons
  - No training cohort → 9.2 concussions per 100 player seasons
  - Reduction of concussion rate with team-wide sports vision training

Clark JF, Graman P, Ellis J, et al. An exploratory Study of the potential effects of vision training on concussion incidence in Football. *Optometry & Visual Performance* 2015. 3(2). 116 - 125



## On-Field Training

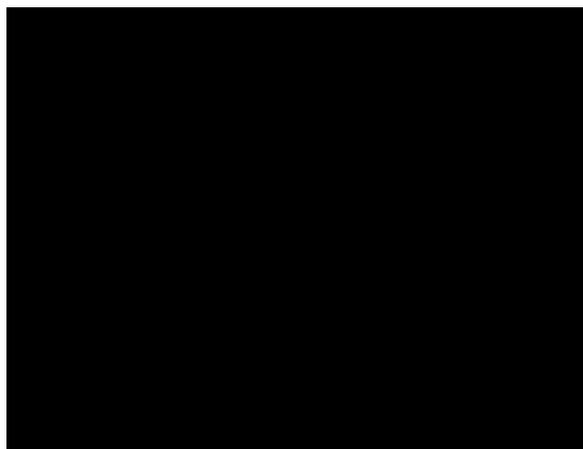
- Integration within current practice drills and training
- Need to work with the trainers / coaches
  - If you can figure out how to integrate, they will do it
    - Especially if it decreases the number of injuries



# The Future is Here

- Virtual Reality
  - Axon Sports
  - Eon Sports VR
  - StriVR

## StriVR



# EON Sports VR

Irvine, CA  
Top Secret VR Labs  
Sneak Peak

<https://www.youtube.com/watch?v=QbMDHEIzooA>



## Follow-up & Reporting

- Routine check up via your assessment tools
- For interprofessional, be in consistent contact



## Vision Training

- You can do training with minimal equipment and still make significant impact
  - Start with refraction and maximizing VA, contrast, and stereo
- Maximize performance
- Have fun

## Thank you

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