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
- 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
  – 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

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

• 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
“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
“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/product-overview/

https://righteye.com/sports-vision-eyeq/
“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

“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

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


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


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

Data from 2014 Annual Meeting of the American Academy of Ophthalmology
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


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

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3932179/
Contrast Sensitivity Training

• Foundational
  – Fogging of lenses
  – Feedback

• Cutting Edge
  – Nutrition
    • Supplements containing carotenoids (lutein, zeaxanthin and mesa-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

Eye – Tracking Training

• Foundational
  – Readalyzer / Visagraph
  – Marsden Ball
  – NSUOCO


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

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

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.svivision.com/index_e.php

http://www.fitlighttraining.com/products/vision-board/


http://www.bataklite.com

http://www.eyecarrot.com/binovi-platform/

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


http://www.svivision.com/index_e.php


http://www.fitlighttraining.com/products/vision-board/

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
  – Senstory Station
  – Neuro-Vision Rehabilitator System
Split Attention / Neuroplasticity Training

• Cutting Edge
  – Sanet Vision Integrator
  – Dynavision2
  – Vision Coach

• 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, Strobos, 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


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

https://www.youtube.com/watch?v=QSJVU7PK660
EON Sports VR

Irvine, CA
Top Secret VR Labs

Sneak Peak

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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References

