Increasing the Role of the Optometrist in Concussion Management

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Visual Consequences of Sports Related Concussions

**CONCUSSIONS BY THE NUMBERS**

- 3.5 million are treated and released from an emergency department.
- 1.1 million are treated and released from an emergency department.
- Among children up to 14 years, 792 result in an extended hospital stay.
- 2,885 deaths.
- 37,000 hospitalizations.
- 435,000 emergency department visits, annually.

Sources: Mayo Clinic, American Academy of Neurology, American College of Emergency Physicians.
What is a Concussion?

Definition- a form of mild traumatic brain injury (mTBI), is defined as “any transient neurologic dysfunction resulting from a biomechanical force”

Concussions are due to either direct impact, such as a blow to the head, or extreme acceleration forces, like whiplash.
Typical Symptoms of Concussion

- Confusion
- Headache
- Disorientation
- Vomiting and/or Nausea
- Unsteadiness

These are visually related

- Light sensitivity
- Blurred Vision
- Double vision
- Loss of place when reading
- Post-traumatic amnesia
- Dizziness
Post Concussion Syndrome

- Post-concussion syndrome is a complex disorder in which a variable combination of post-concussion symptoms — such as headaches and dizziness — last for weeks and sometimes months after the injury that caused the concussion.

- In most people, post-concussion syndrome symptoms occur within the first seven to 10 days and go away within three months, though they can persist for a year or more.

- Post-concussion syndrome is considered when symptoms last for more than three months.
The Concussion Crisis

- CDC estimates reveal that up to 3.8 million concussions occur each year.
- Fewer than 10% of sport related concussions involve a loss of consciousness (e.g., blacking out, seeing stars, etc.).
- Estimated 47% of athletes do not report feeling any immediate symptoms after a concussive blow.
Basics of Concussion Management

Sideline Tests (Remove from play)

- Sports Concussion Assessment Tool (SCAT3)
- Standardized Assessment of Concussion (SAC)
- King-Devick Test
Basics of Concussion management (Return to play)

- Cornerstone is baseline testing
- ImPACT Test
  - ImPACT (Immediate Post-Concussion Assessment and Cognitive Testing) is a scientifically validated computerized concussion evaluation system
  - Ages 10 through adulthood. ImPACT allows for baseline and post injury neurocognitive testing
  - Allows for management of concussions on an individualized basis.
  - Neurocognitive assessment can help to objectively evaluate the concussed athlete's post-injury condition and track recovery for safe return to play.
Basics of Concussion management (Return to learn)

- Complete Physical and Cognitive Rest
  - No school, reading, texting, or computer use

- Light Cognitive Activity
  - Reintroduce reading for 5-10 minute blocks
  - Enlarge font if possible

- Moderate Cognitive Activity
  - Advance reading time in 15-30 minute increments
  - Texting, computer use allowed

- Return to School (with accommodations)
  - ½ day with accommodations for tests, homework, etc
  - Full day with accommodations

- Return to School (without accommodations)
Interdisciplinary Rehabilitation Team in Concussion management

• **Primary Physicians**
  - Physiatrists (MDs specializing in physical medicine and rehabilitation)
  - Neurologists
  - Family Physicians/Internists
  - **Sports Medicine Physicians**

• **Rehabilitation Specialists**
  - Neuropsychologist (specializing in evaluation and rehabilitation of cognitive impairments)
  - Psychiatrists/Psychologists
  - Physical/Vestibular/Occupational Therapists
  - Athletic Trainers
  - **And--- Optometrists**
Optometry is **needed and wanted** in concussion management

**Requested Service: Vision therapy evaluation and treatment**

Barry, I referred a 17 year old xxxxx to see you who has a constant headache following getting a 4th concussion in MVA before completely recovering from the third concussion. She has been accepted to xxx Honors Program and is going away after she graduates in June so we do not have much time. If you could get her in ASAP I would appreciate it.
Common Visual Symptoms in Post-Concussion Syndrome

- Persistent light sensitivity
- Headaches and asthenopia after short periods of near work
- Diplopia and blurred vision after short periods of near work
- Decreased reading speed
- Decreased comprehension
- Visual discomfort in multiple environments
Role of Optometry in Concussion Care

As a member of, or consultant to, the patient's rehabilitation team, the optometrist is able to relate specific visual dysfunctions to patient's symptoms and performance in order to provide remediation and guidance. This will increase the effectiveness of the overall rehabilitation program, which is often highly dependent upon vision.
Role of Optometry in Concussion Care

The evaluation and treatment of the patient with brain injury may include the following:

- Comprehensive eye and vision examination
- Extended sensorimotor evaluation
- Higher cerebral function assessment of visual information processing
- Extended visual field evaluation
- Electrodiagnostic testing
- Spectacle prescriptions (including lenses, prisms, and therapeutic tints)
- **Neuro-optometric rehabilitation (vision therapy)**
Vision & Concussion

Studies show visual dysfunction is prevalent in patients after concussion:

- About 40% have some type of accommodative dysfunction
  - Insufficiency, infacility and excess
- About 60% have some type of vergence dysfunction
  - 42% - Convergence Insufficiency
- About 30% have saccadic/oculomotor dysfunction
Common Vision Symptoms

- Headaches and asthenopia after short periods of near work
- Diplopia and blurred vision associated with near work
- Decreased reading speed and reading comprehension
- Visual memory deficits
- Visual discomfort in busy visual environments
- Persistent light sensitivity
What does this mean?

- Neuro-rehabilitative optometrists understand the visual system better than any other medical professional.
- We have the opportunity to help retrain the visual system to gather and process visual information more efficiently and effectively.
- We often can eliminate the visual symptoms most commonly associated with concussion and post-concussion syndrome.
Case Report: JP

- JP sustained a severe concussion on May 21, 2012 when he swam full speed into a wall, breaking his nose. On the ride to the hospital he lost consciousness and experienced amnesia.

- Subsequent concussions were likely sustained due to falls. One such fall occurred June 2012 when JP lost his balance and hit the side of his head.

- JP’s main symptoms include: severe eyestrain, headache, nausea, and fatigue, all of which are worsened by being in crowds. He experiences visual disturbances almost constantly but more so with fatigue. He is also light and motion sensitive, and tends to skip and lose his place when reading.

- JP has undergone vestibular, exertional, physical, occupational, and cognitive therapies.
<table>
<thead>
<tr>
<th>Test</th>
<th>Exam Result</th>
<th>Normal Range</th>
<th>Interpretation</th>
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<tr>
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<td>LE: 17 cpm</td>
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<td>7.9 grade level</td>
<td>9.0 or greater grade level</td>
<td>Oculomotor Dysfunction</td>
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</tbody>
</table>

Prism dipters = prism diopters, cpm = cycles per minute, OD = right eye, OS = left eye, OU = both eyes
Recommendations

- **Full Time Spectacle Correction**
  - It is strongly recommended that JP wear his newly prescribed spectacle correction for near based activities such as school-work and reading, over his current contact lens correction. This spectacle correction has a small, but significant prescription and a therapeutic tint to make JP more visually comfortable.

- **Vision Therapy**
  - A program of vision therapy is recommended to remediate the visual conditions discovered during the evaluation. I anticipate an active vision therapy program of about four months, 24 sessions, to remediate the vision conditions documented in the report. JP will be re-evaluated periodically to assure that he is making progress in his vision therapy program.

- The goals and hoped for benefits of the vision therapy are summarized below:
  - a. **Improve convergence and eye teaming abilities**, which would have the effect of improving visual comfort as well as making reading and studying more efficient.
  - b. **Improve visual tracking skills**, which would reduce loss of place and skipping or words while reading and the secondary benefit of improved selective and sustained visual attention.
  - c. **Improve accommodative (focusing) ability**, which should serve to make it easier to focus quickly and accurately to the blackboard and the paper and reduce blurred distance vision after reading.
  - d. **Improve fusional stability**, which will help JP feel more comfortable and improve his visual stamina.
## Pre & Post Vision Therapy Evaluation

<table>
<thead>
<tr>
<th>Test</th>
<th>Initial Evaluation</th>
<th>Re-Evaluation</th>
<th>Interpretation</th>
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<td>RE: 20/20 LE: 20/20</td>
<td>Normal</td>
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<td>Near Phoria</td>
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<tr>
<td>Near Convergence range</td>
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<tr>
<td>Distance Divergence recovery</td>
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<td>Visagraph, 7th grade text</td>
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<td>13.4 grade level equivalency</td>
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</tr>
</tbody>
</table>

Pd = prism diopters
cpm = cycles per minute
OD = right eye
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Testimonial From JP

“I feel that I have improved tremendously. My headaches have subsided completely from the combination of vision therapy and propranolol therapy. The near vision glasses that were prescribed have decreased my ocular pain and have made reading easier. I feel that vision therapy has helped my visual stamina as my eyes no longer tire. Supermarkets and crowded areas do not bother me as they once did. “

“I feel 100% back to myself, back to being ‘visually normal’ ”
Thank you
Concussion: COVD joint symposium
Dr. DeAnn M. Fitzgerald
at
Dr. D.M. Fitzgerald and Associates
CR Vision and Motion
Active Evolution: High Performance Vision
Cedar Rapids, IA
Docfitzgerald.com
Where do you,, the optometrist, want to be?

- The parent and/or coach who happens to be an optometrist
- The primary care optometrist who is educated in recognizing a potential concussion and referring them to the appropriate provider
- The optometrist who (like me) is championing concussion education in the community, providing education and baseline testing along with wanting to be a part of the concussion community in offering diagnosis, management and treatment in the very beginning
- Or the optometrist who will be on the team but not until after 14 days or more and be that therapist to help relieve the student athlete from a protracted recovery
Best practices

- Baseline testing (preseason)
- Time of injury assessment
- Removal from play (same day minimum)
- Post injury assessment
- Graduated step approach to return to learn/play (RTL/RTP)
Why baseline testing?

- To have comparative data pre- and post-injury

- To identify impairments before the season starts

- To create a comprehensive injury prevention program
What is baseline testing?

- Typically starts with **pre-season** physical, which should also include history of previous concussions and/or pre-existing symptoms.

- Ideally, computerized testing is available.

- If computerized testing not available (which is typically more limited for balance and visual testing than cognitive) then perform clinical tests.
How is this presently being performed?

- Computerized cognitive testing is becoming standard
- Can be done in large group setting simultaneously on computers (benefit)
- Computerized balance testing is preferred but not as accessible
- Takes more time because it requires an examiner to perform balance tests
- Small percentage of organizations perform baseline balance testing although it is recommended
- Vision usually only static visual acuity but not part of the standard physical assessment
Cognition: Clinical Value

- Symptoms may resolve before cognitive impairments

- In 12-17 yo, a concussion with < 15 min of symptoms at time of injury required 7 days for cognition to return to baseline and symptoms to resolve (Lovell, Clin. Sports Med. 28 (1) Jan. 2009)

- Although no tool should be used in isolation to make a RTP decision, numerous studies have shown cognitive testing to be of clinical value in concussion assessment
Cognition tests

- HeadMinder
- Axon Sports
- Concussion Vital Signs
- ImPACT
- All web-based products
Balance: Clinical value

- Both computerized and non-computerized studies have shown postural instability following a concussion.
- Typically, postural stability will decline most when relying on vestibular (inner ear) cues for balance.
- Example: eyes closed on unstable surface.
- Vestibular system and ambient are dominant systems during dynamic activities.
Visual impairments are common following a concussion (e.g., blurriness, difficulty reading)

Assessing the visual system provides valuable insight to clinical evaluation

Oculomotor system findings (pursuits, saccades, fixations) more suggestive of central nervous system involvement
My elevator speech

- 70% of our brain is dedicated to vision in some fashion
- 80% of all sensory comes through the eyes
- 90% of mTBI patients have 1 or more oculomotor affects
- 40% of oculomotor affects last greater than 3 months

- As OD’s, we need to be somewhere in the concussion process
In the present concussion world

- 43 diagnoses for mTBI
- It is being broken down into 6 trajectories
  - Vision
  - Vestibular
  - Cognition/fatigue
  - Anxiety/mood
  - Cervical
  - Post-trauma migraine
Vision assessment

- Vestibular Ocular Motor Screening (VOMS)—based on symptoms provocation
  1) Horizontal and vertical pursuits
  2) Horizontal and vertical saccades
  3) NPC
  4) Visual Motor test

King-Devick is great for recognizing a potential concussion both as a baseline screener and a post injury test. No tool is a stand alone to return to learn/play--need cognitive testing
Our practice

- We have helped facilitate over 7000 baseline testings.
- Last year alone we signed up 5 high schools and 1 junior college
- We teach the school nurse/AT how to do this and then we help facilitate follow up and treatment
- In our office, we offer baseline testing—includes ImPACT/KD and VOMS
- We see the student athlete in 24-72 hours acute or we see them within 10 day period or after 21 days. Time of injury and time of treatment will dictate what we do.
Team Approach

- I am working with all providers to ensure the recovery and success of the student athlete
- As behavioral optometrists, we possess a solution
Awareness + no solution = Hysteria

- A 5 year study that is coming out about concussion and sports vision performance training indicates that training athletes with vision performance techniques decreases the incidence and severity of concussion.
- Over a 5 year period, a collegiate football team reduced the incidence of concussions from 21 concussions a year to 1 concussion per year.
- In addition, the duration of concussion recovery time was greatly reduced.
- A study is already out that takes 2 group of athletes with ACL injuries rehabs one group traditionally and the other with visual spatial techniques shows the injury rate to be significantly reduced in the visual performance enhanced group.
Studies and published articles

- Clark, Joseph F.
- http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4127506/
COVID/OEPF/NORA Joint Symposium - Increasing the Role of the Optometrist in Concussion Management

Charles Shidlofsky, O.D., FCOVD
Neuro-Vision Associates of North Texas
Plano, Texas
Disclosures

☐ I have no interest in any of the products or services that are included in this lecture

☐ I do not participate in any advisory position to any company
How to become Part of the Concussion Team?

- Educate, Educate and Educate on Traumatic Brain Injury
  - Meetings - COVD, NORA, OEP, AOA Sports Vision, and others
  - Shameless Plug - International Sports Vision Academy
  - Journals - OVP, Sports Vision journals (mostly European), Internet searches
  - Text books: **Brain Injury Medicine** - Zasler, **Neuro-Visual Processing Rehabilitation: An Interdisciplinary Approach** by Bill Padula, **Vision Rehabilitation** by Suter and Harvey
  - Don’t be afraid to look outside of Optometry for answers
How to become Part of the Concussion Team?

- If you are currently working with Rehab Facilities (whether on staff or referred into your office)
  - Share your knowledge
  - Be very open to working closely with other medical professionals: OT’s, SLP’s, PT’s,Physiatrists, Neuro-Psychs and others
    - This shows that you are part of the medical team!!
    - They will come to you for your expertise!!

- Do Therapist Training- Who and when to refer- basic treatment techniques (Home Therapy)
The Main Point!!!

BUILD TRUST
For myself: Became Team eye doctor/concussion specialist for three minor league professional sports teams

- Why minor league?
  - Big bucks to do major sports leagues!!! Mostly large hospitals and health systems—but not unheard of

- Other Options: High Schools, College, Competitive Sports Teams
  - Get to know the Team Trainer— they put together the medical staff
  - Get to know other medical staff— set up referral relationships for patients other than the athletes—their regular patients
Promote Optometric Testing: Vision Screening of athletes including King-Devick and/or Impact (Impact may be provided by the team Neuro-psych or Physician)

- King-Devick- A true Optometrically-developed post-concussion, return to play test...more on this in a bit

Once again: Make sure the team physicians, Neuro-psych, Chiropractor, massage therapist, dentist, team owner, marketing staff and anyone else who will listen- what you can do and how you can be an important part of the team!!
King-Devick Concussion Screening Test

Scored on subject’s speed and accuracy of rapid number naming task
Establish Baseline and testing post-injury

- **Baseline =** Fastest total time of two error-free trials
  - Subject reads numbers left to right as quickly as possible while making no errors

- **Post-injury =** Retest *once* on sidelines and compare to Baseline
  - Allow subject to finish all 3 test cards and record time & errors
  - *INCREASED* time (3+ seconds) or ANY ERRORS → Remove-From-Play For Concussion
Why It Works

Vision alone accounts for more than 55% of your brain’s pathways.

The King-Devick Test quickly screens for impairments of:

- Eye Movements
- Visual Processing
- Concentration
- Attention
- Speech
- Language
- Other correlates of brain function
fMRI of Saccadic Pursuit

Source: Ventura et al, Lancet Neurol 2014
Mayo Clinic Researchers Validate Rapid Sideline Concussion Test For Youth Athletes

Eye movement test detects concussions and possible 'silent' concussions

- 150 High School Ice Hockey Athletes
- 20 Suspected Concussions
  - All 20 Had Worsen of K-D Test Post-Injury Scores (>5s; mean 7.3s)
  - All 20 Later Diagnosed With Concussion
- 51 non-concussed players after game showed no change (43.4s to 42s)
- 11 non-concussed players had slowed KD times at end of season

ACCORDING TO THE RESEARCH
ImPACT Test
Neuro-cognitive test

☐ This is a 25 minute test to see if an athlete is ready to return to play
☐ Based on doing a pre-season screening and then a re-test if the athlete has sustained a concussion.
☐ Tests the following areas:

☐ Attention span
☐ Working memory
☐ Sustained and selective attention time
☐ Response variability
☐ Non-verbal problem solving
☐ Reaction time
ImPACT Test

- For teams - Not typically given by the OD—however we must have a good understanding of this test
- I have used this test for 14 years in my practice because it is an excellent neuro-cognitive test for older children and adults
  - New version of this test just released for Physician offices called ImPact Workplace where you can customize the questions
  - A Children’s test will be released anytime now
In Summary

- King-Devick Test is a REMOVE FROM PLAY test
- ImPACT is a RETURN TO PLAY test
K-D Test as a Complement to SCAT3/Child-SCAT3 in Youth & Collegiate Athletes

- Concussed athletes demonstrated K-D **worsening** from baseline (mean 5.2s)
- Non-concussion controls showed K-D **improvement** from baseline (mean 6.4s)

- K-D showed the greatest capacity to distinguish concussion vs. control groups based on changes from baseline
  - SAC showed a ≥2-point worsening in:
    - 20% of concussed players
    - 21% of controls
  - K-D showed worsening from baseline in:
    - 75% of concussed players
    - 7% of controls

The Future

☐ Goals: To be able to serve school districts and perhaps major league professional teams
  ■ Create a Sports Physician Network to pool resources to serve sports teams---to create outreach---and to educate the public
  ☐ Issues: Who to invite?

☐ More cross-referral among professionals
  ■ This happens as we educate each other about our capabilities
Thank You

☐ Any Questions?
☐ My contact info:
  - Email: dr-s@dr-s.net
  - Office Phone: 972-312-0177
  - Website: www.dr-s.net