Optometric Responsibility to the Learning Disabled Child

Valerie M. Kattouf, O.D., F.A.A.O., F.C.O.V.D.
Associate Professor, Illinois College of Optometry
Chief, Pediatrics/Binocular Vision Department, Illinois Eye Institute

What questions do you have on this topic?

Please feel free to email me your questions prior to our lecture on October 27
vkattouf@ico.edu

Please feel free to ask me questions throughout the presentation

Lectures on:

Digital media effect on Vision and Learning
Visual implication of TBI / Concussion
Vision and Learning issues

What visual diagnosis do we see in these patients?

Uncorrected Refractive Error
Accommodative Disorders
Binocular Vision Disorders
Ocular Motor Dysfunction

Optometric Exam Sequence

- Refraction
- Assessment of Accommodative Skills
  - Minus lens amplitudes
  - Flipper Facility as needed
- Assessment of Binocular Vision Status
  - Cover test - distance and near
  - Vergences - typically near, distance as needed
  - NPC - Near Point of Convergence
- Ocular Motility evaluation
  - King Devick Test
  - DEM - Developmental Eye Movement Test

Who has seen this patient?
Common History
From an insurance review
7 year old 5 month female

- Asthenopia and blur distance and near
- Difficulty reading
- Words seem to “jump” or “float” on the page
- Loses her place
- Skips lines
- Better comprehension when read to vs. visual input
- Will read last letter of the word as the 1st letter of the word
- Reading tutor x 4 months, now reading at grade level
- Struggles with spelling does not retain the words once learned
- Reverses letters and numbers occasionally
- Handwriting messy and poorly spaced / inconsistent sizing
- Trouble putting thoughts on paper
- Does well in math with exception of story problems and timed tests
- Coordinated in regard to athletics

How do Reading and Learning Disabilities present to our practices

Reading Disability
Learning Disability
Dyslexia
Special Education
IEP - Individual Education Plan
504 B - test accommodations
RTI - response to Intervention

What is Dyslexia?
a general term for disorders that involve difficulty in learning to read or interpret words, letters, and other symbols, but that do not affect general intelligence

- People with dyslexia have trouble matching the letters they see on the page with the sounds those letters and combinations of letters make. And when they have trouble with that step, all the other steps are harder.

What are common optometric diagnosis in the reading disabled population?

- Refractive Error
- Accommodative Disorders
- Binocular Vision Disorders
- Ocular Motor Dysfunction

What is Dyslexia?

- Dyslexic children and adults struggle to:
  - read fluently
  - spell words correctly
  - learn a second language
  - handle other challenges.

But these difficulties have no connection to their overall intelligence.

Dyslexia is an unexpected difficulty in reading in an individual who has the intelligence to be a much better reader.

While people with dyslexia are slow readers, they often, paradoxically, are very fast and creative thinkers with strong reasoning abilities.

Dyslexia is also very common, affecting 20 percent of the population.

Scientific research shows differences in brain connectivity between dyslexic and typical reading children, providing a neurological basis for why reading fluently is a struggle for those with dyslexia.

Dyslexia can’t be “cured” – it is lifelong. But with the right supports, dyslexic individuals can become highly successful students and adults.

Frequency of Visual Deficits in Children With Developmental Dyslexia (DD)
Raghuram A1,2, Gowrisankaran S1,2, Swanson E1, Zurakowski D3,4,5, Hunter DG1,2, Waber DP6,7.

- IMPORTANCE: Developmental dyslexia (DD) is a specific learning disability of neurobiological origin whose core cognitive deficit is widely believed to involve language (phonological) processing. Although reading is also a visual task, the potential role of vision in DD has been controversial, and little is known about the integrity of visual function in individuals with DD.

- OBJECTIVE: To assess the frequency of visual deficits (specifically vergence, accommodation, and ocular motor tracking) in children with DD compared with a control group of typically developing readers.

- PARTICIPANTS: 29 children with DD and 33 typically developing (TD) children.
A case of a child with reading / learning disabilities

Accommodative Disorders
DD group 55%
TD group 9%

Vergence Disorders
DD group 34%
TD group 15%

Ocular Motor Dysfunction
DD group 62%
TD group 15%

Examination history

<table>
<thead>
<tr>
<th>Male, DOB 10/15/2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 years 3 months</td>
</tr>
<tr>
<td>3 years 6 months</td>
</tr>
<tr>
<td>4 years 8 months</td>
</tr>
<tr>
<td>5 years 8 months</td>
</tr>
<tr>
<td>6 years 2 months</td>
</tr>
</tbody>
</table>

6 year, 2 month old male (1)

<table>
<thead>
<tr>
<th>Initial Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case History</td>
</tr>
<tr>
<td>Visual Acuity sc</td>
</tr>
<tr>
<td>OD OS</td>
</tr>
<tr>
<td>Cover Test sc</td>
</tr>
<tr>
<td>Refractometry</td>
</tr>
<tr>
<td># No amount of plus improved NVA, MD better with plus minus plus acceptance at near nothing improved distance (see case history)</td>
</tr>
<tr>
<td>Near Prism Bar Vergences cc</td>
</tr>
</tbody>
</table>

6 year, 2 month old male (1)

<table>
<thead>
<tr>
<th>Initial Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD OS</td>
</tr>
<tr>
<td>NRA/YRA</td>
</tr>
<tr>
<td>Binocular</td>
</tr>
<tr>
<td>Accommodative Facility</td>
</tr>
<tr>
<td>Oculometer Testing</td>
</tr>
<tr>
<td>Visually Saccades / Pursuits</td>
</tr>
<tr>
<td>King Devick</td>
</tr>
<tr>
<td>Refractometry</td>
</tr>
</tbody>
</table>
Accommodative Insufficiency

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blurred vision at near</td>
<td>Low accommodative amplitudes</td>
</tr>
<tr>
<td>Discomfort and strain associated with near tasks</td>
<td>Low PRA</td>
</tr>
<tr>
<td>Fatigue associated with near point tasks</td>
<td>High MEM</td>
</tr>
<tr>
<td>Symptoms worse at end of day</td>
<td>Falls monocular accommodative facility with minus lenses</td>
</tr>
<tr>
<td>Difficulty with attention and concentration with reading</td>
<td>BAR - Fails (-)</td>
</tr>
</tbody>
</table>

Assessment / Plan

- Accommodative Insufficiency
  - Begin Vision therapy to treat accommodative and oculomotor disorder
  - Rx given for near and school work (+1.00 D OU)
  - Attempt to work patient into plus acceptance

Hyperopia

Why is it so important in this population?

Uncorrected Hyperopia and Preschool Early Literacy: Results of the Vision in Preschoolers (VIP) Study

PURPOSE: To compare early literacy of 4- and 5-year-old children with lower magnitudes (≥3 D to <4 D) demonstrated 1 or more reductions in function.

RESULTS: More than half of children with lower magnitudes (≥3 D to <4 D) demonstrated 1 or more reductions in function.

CONCLUSIONS: Uncorrected hyperopia (≥3 D to ≤6 D) or hyperopia (≥4 D to ≤6 D) were at greatest risk, although more than half of children with lower magnitudes (≥3 D to <4 D) demonstrated 1 or more reductions in function.

Attention and Visual Motor Integration in Young Children with Uncorrected Hyperopia

PURPOSE: To compare attention, visual motor, and visual perceptual skills in uncorrected hyperopic preschool age children without strabismus or amblyopia.

METHODS: Children aged 4 or 5 years ( Cyclo refractive).

Hyperopia ≥ 3.0 D to ≤ 4.0 D

Approximately 1.0 D

Anisometropia ≥ 1.0 D

RESULTS: Among 4- and 5-year-olds absence, visual motor integration deficits were significantly reduced in uncorrected hyperopic preschool age children without strabismus or amblyopia.

CONCLUSIONS: Uncorrected hyperopia (≥3 D to ≤4 D) was associated with reduced visual function (near visual acuity worse than 20/40 or near acuity worse than 2040 seconds of arc).

Significance: Uncorrected hyperopia (≥3 D to ≤4 D) was associated with reduced visual function (near visual acuity worse than 20/40 or near acuity worse than 2040 seconds of arc).

RESULTS: Two hundred forty-four hyperopes and 244 emmetropes

CONCLUSIONS: Uncorrected hyperopia (≥3 D to ≤4 D) was associated with reduced visual function (near visual acuity worse than 20/40 or near acuity worse than 2040 seconds of arc).
PURPOSE:
To compare emergent literacy skills in uncorrected hyperopic and emmetropic children.

METHODS:
“Hyperopes” ≥ 2.00 D and “emmetropes” ≤ 1.50 D were tested for visual acuity (VA) and assessed for their emergent literacy skills (three standardized tests of emergent orthography, and phonological awareness). Parents completed a survey of their demographic, health/developmental conditions, and home literacy experiences. Visual motor and visual perceptual skills tests were used to assess any visual cognitive differences.

RESULTS:
There were no differences in single letter VA for hyperopes and emmetropes and crowded letters for the right eye. Crowding effects were significantly greater in the left eye for hyperopes (t (30)=−2.74, p=0.01), with two of the hyperopes showing abnormal crowding. Hyperopes lagged behind emmetropes in letter and word recognition ability (Mann-Whitney U=72, p=0.049), receptive vocabulary (F(1,30)=9.64, p=0.004), and emergent orthography (F(1,29)=5.43, p=0.03). The groups did not differ in phonological awareness skills (F(1,29)=0.39, p=0.54). No statistically significant differences between the two groups were found for visual motor or visual perceptual skills, age, and some family variables known to affect the acquisition of literacy skills.

CONCLUSIONS:
In this pilot study, uncorrected hyperopic children, ages 4 to 7 years, showed reduced performance on tests of letter and word recognition, receptive vocabulary, and emergent orthography and crowded VA, despite no difference in phonological awareness skills, visual cognitive skills, and other family variables known to affect the acquisition of literacy skills. The relationship between hyperopia and the poorer progress in emergent literacy is complex, and it is not clear if the relationship is causal, and whether the hyperopes will catch up to the emmetropes with time.

LESSON: Hyperopia Matters!
Cycloplege these patients

Back to our patient....

EXAM 2

6 year, 4 month old male (2)

2 month follow up

Case History

Blur and daily headaches resolving
Wearing +1.00 D full time
Mom notes reliance and positive association with Rx
(“He wants them on all of the time”)
Only took a week or so to adjust to Rx
VT program weekly, HVT 4-5x per week
No specific neurological concern
No headaches or severe pain

OBJECTIVE:
To assess asthenopia prevalence and associated factors in schoolchildren aged 6-16.

RESULTS:
964 children
Asthenopia prevalence was 24.7%
Visual acuity of 20/25 or better in both eyes in 92.8%
Stereopsis test was normal in 99.4%
Strabismus was found in 3.5%
37.8% had astigmatism
71.6% had mild hyperopia
13.6% had moderate hyperopia
6.1% were myopic
Near point of convergence was abnormal in 14.0%
AC/A ratio was found to be altered in 17.1% of them.

CONCLUSION:
Children and adolescents have expressive prevalence of asthenopia. The prevalence of visual function alterations does not differ from the general population, and, therefore, they are not prerequisites. It is very important that the mechanisms and risk factors be better defined. Health professionals need to be on the lookout for complaints of visual fatigue because of its potential to influence learning and school performance.

Asthenopia / Headaches
Do children complain?
6 year, 4 month old male (2)

2 month follow up

<table>
<thead>
<tr>
<th>Visual Acuity cc</th>
<th>Distance</th>
<th>Near</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20/20 OD, OS</td>
<td>20/20 OD, OS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cover Test sc</th>
<th>HC EP sc</th>
<th>HC EP sc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+1.00 sph</td>
<td>+1.00 sph</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dry Retinoscopy</th>
<th>Cyclo Retinoscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+1.75 sph</td>
</tr>
<tr>
<td></td>
<td>+1.25 sph</td>
</tr>
</tbody>
</table>

Assessment / Plan

- **Accommodative Insufficiency**
  - Patient undergoing weekly orthoptic treatment with HVT 3-5 x / week
  - Amplitudes have increased significantly
  - Working OMD skills in VT as well

- **Hyperopia**
  - Patient comfortably wearing +1.00 D OU full time
  - Relies on Rx
  - RTC 3 months

---

**Accommodative Insufficiency**

**Symptoms**

<table>
<thead>
<tr>
<th>Blurred vision at near</th>
<th>Low accommodative amplitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discomfort and strain associated with near tasks</td>
<td>Low PRA</td>
</tr>
<tr>
<td>Fatigue associated with near point tasks</td>
<td>High MEM</td>
</tr>
<tr>
<td>Symptoms worse at end of day</td>
<td>Fails monocular accommodative facility with minus lenses</td>
</tr>
<tr>
<td>Difficulty with attention and concentration with reading</td>
<td>BAR - Fails (-)</td>
</tr>
</tbody>
</table>

**Clinical Signs of Accommodative Problems**

- **Hyperopic Rx has benefits**
  - May improve near symptoms
  - May not tolerate Rx at distance

- **Retinoscopy reflex fluctuates**
  - Often see A/R astigmatism

- **Variable acuity / may not achieve level expected as per findings**
  - Visual Acuity "mushy"
  - Reduced distance VA
  - Reduced near VA
Low A/R Cylinder – Birnbaum Theory

Onset of myopia often preceded by low A/R cyl (Hirsch 1964)
↓
A/R cyl is an early adaptation
Lag of accommodation is present during near work
(Accommodation is localized beyond the plane of regard)
↓
A/R cyl produces vertically oriented blur circles which permit resolution of the vertically oriented characters of our language
↓
A/R cyl permits one to accommodate less while maintaining adequate visual resolution at near point with a minimum loss of distance visual acuity

Low A/R Cylinder – Birnbaum Theory

As Near point stress persists or visual efficiency is unsatisfactory
↓
Myopia development may occur

We often see low A/R cyl reduce or disappear with plus lens treatment or vision therapy

Accommodative Insufficiency Treatment

Treatment of Accommodative Dysfunction in Children: results from a Randomized Clinical Trial
Optometry and Vision Science, Vol. 88, No.11, November 2011, Scheiman, M., Cotter S, et.al.

- 211 children ages 9-17 with symptomatic CI
  - 74% had accommodative dysfunction
  - 29% had decreased amplitude of accommodation when compared to age norms
  - 19% had decreased accommodative facility
  - 26% both

Conclusion:
Vision therapy/orthoptics was effective for improving decreased accommodative amplitude and accommodative facility

EXAM 3

6 year, 8 month old male (3)

Entering 1st grade in Fall

Case History

- Continues to wearing plus 1.00 by full time
- Has accommodative dysfuncy in reading
  - Kindergarten teacher not concerned
  - Has check list of visual symptoms
  - Enjoys reading
  - Spelling ability below peers ability
  - Has weekly tutor to support reading development
  - Child reads at an average rate
  - Will not read last letter of the word as the 1st letter of the word
  - Writing messy and poorly spaced / inconsistent sizing
  - Trouble putting thoughts on paper
  - Does well in math with exception of story problems and timed tests
  - Coordinated in regard to athletics

REVISIT : Common History

From an insurance review
7 year old 5 month female

- Asthenopia and blur distance and near
- Difficulty reading
- Words seem to "jump" or "float" on the page
- Loses her place
- Skips lines
- Better comprehension when read to vs. visual input
- Will read last letter of the word as the 1st letter of the word
- Reading tutor x 4 months , now reading at grade level
- Struggles with spelling does not retain the words once learned
- Reverses letters and numbers occasionally
- Handwriting messy and poorly spaced / inconsistent sizing
- Trouble putting thoughts on paper
- Does well in math with exception of story problems and timed tests
- Coordinated in regard to athletics
### 6 year, 8 month old male (3)

#### Entering 1st grade in fall

<table>
<thead>
<tr>
<th>Visual Acuity cc</th>
<th>Distance</th>
<th>Near</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/20 OD, OS</td>
<td>20/25 OD, OS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cover Test sc</th>
<th>2Δ EP sc</th>
<th>6Δ EP sc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ortho sc</td>
<td>+1.25 sph</td>
<td>+1.00 sph</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dry Retinoscopy</th>
<th>+2.75 sph</th>
<th>+2.75 sph</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Cyclo Retinoscopy</th>
<th>+2.75 sph</th>
</tr>
</thead>
</table>

### 2 month follow up

<table>
<thead>
<tr>
<th>Near Prism Bar Vergences sc</th>
<th>Base In</th>
<th>Base Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>x/8/4</td>
<td>x/30/25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minus Lens Amplitude</th>
<th>8.50D</th>
<th>8.50D</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>5.50D</td>
<td>7.50D</td>
</tr>
<tr>
<td>s</td>
<td>9.50D</td>
<td>10.00D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bincular Accomodative Facility</th>
<th>4.5 cpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous: Cannot clear either +/- 2D</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monocular Accomodative Facility</th>
<th>7.5 cpm OD, OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plus : minus</td>
<td></td>
</tr>
</tbody>
</table>

| MEM | +0.50 OD, OS |
| DEM | Visagraph |

Below age expected

Could not perform.

### Assessment / Plan

**Hyperopia / Accomodative Insufficiency - resolving**

- +/-2.00 Flippers improved from last exam, still below age expected.
- Ange improved since last visit OD,OS.
- Hyperopia increase in cycloplegic examination today
- Continue wearing +1.00 Rx
- Push plus at follow up
- Consider need to increase plus in single vision vs. bifocal

**Oculomotor Deficiency**

- Type III on DEM today, suggestive of difficulty in automaticity.
- Visagraph also done today, difficulty analyzing due to high fixations. Consider retesting in 1 year.
- Poor performance on laterality / directionality testing
- Re-evaluate after start of 1st grade

### 7 year, 6 month old male (4) in 1st grade

#### Case History

More concerned about reading skills.

1st grade teacher notes concern on sight words line as just at grade appropriate level, will be the weak point.

Poor spelling, word often unrecognizable.

Child avoids reading words at all costs.

Continues to be “headachy" child, especially on tired.!
7 year, 6 month old male (4)

<table>
<thead>
<tr>
<th>Near Prism Bar Vergences cc</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Base In</td>
<td>x/8/2</td>
<td></td>
</tr>
<tr>
<td>Base Out</td>
<td>x/45/30</td>
<td></td>
</tr>
<tr>
<td>OD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Minus Lens Amplitude (age expected 11.5D)

<table>
<thead>
<tr>
<th>12.00D</th>
<th>5.00D</th>
<th>8.50D</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.00D</td>
<td>4.00D</td>
<td>8.50D</td>
</tr>
</tbody>
</table>

Assessment / Plan

- Accommodative Insufficiency – resolving
- Convergence Excess (note from chart below)
  - note B.s. EP with out plus Rx / with +2 D Patient is ortho
  - Increase hyperopic Rx noted over time
  - Consider CL rx for patient
- Hyperopia
  - Rx given
  - Increase in plus today +1.00 OU → +1.50 OU
  - Today cyclo is at +2.75 more than a diopter increase from the past

Convergence Excess

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthenopia and headaches</td>
<td>Significant esophoria at near</td>
</tr>
<tr>
<td>Intermittent blur</td>
<td>Reduced negative fusional vergence at near</td>
</tr>
<tr>
<td>Intermittent diplopia</td>
<td>High AC/A ratio</td>
</tr>
<tr>
<td>Symptoms worse at end of day</td>
<td>Low PRA</td>
</tr>
<tr>
<td>Burning and tearing</td>
<td>High MEM</td>
</tr>
<tr>
<td>Inability to sustain and concentrate</td>
<td>Falls binocular accommodative facility testing with -2.00</td>
</tr>
<tr>
<td>Sleepiness when reading</td>
<td>Decreased reading comprehension over time</td>
</tr>
</tbody>
</table>

Convergence Excess Treatment Options

- Lenses
  - Refractive Error as necessary
  - Optimize spectacle and/or contact lens Rx

- Added Lenses
  - Plus lens
    - Lowest amount of plus to eliminate symptoms and normalize exam data
  - Prism
    - Rarely needed 2° high AC/A ratio

- Orthoptics / Vision Therapy
  - generally requires 12-24 office visits
  - dependent upon age, motivation, compliance

Convergence Excess

What are you going to do?
Vision Therapy for Convergence Excess

Journal of American Optometric Association, 1997 Feb;68(2)81-6
Gallaway M, Schieman M

Record review of 83 patients with CE

Vision therapy was successful in enhancing negative fusional vergence and eliminating symptoms in the vast majority of patients with convergence excess and should be considered an effective treatment for this condition

84% of patients reported a total elimination of initial symptoms

8 year, 1 month old male (5)

<table>
<thead>
<tr>
<th>In 2nd grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Acuity cc (+1.50 D OU)</td>
</tr>
<tr>
<td>20/20 OD, OS</td>
</tr>
<tr>
<td>Cover Test</td>
</tr>
<tr>
<td>8А EP ic +1.00</td>
</tr>
<tr>
<td>ΔA EP ic +1.00</td>
</tr>
<tr>
<td>Dry Retinoscopy</td>
</tr>
<tr>
<td>+2.00 sph</td>
</tr>
<tr>
<td>Refraction pushing plus</td>
</tr>
<tr>
<td>-2.50 sph OU = +2.00</td>
</tr>
<tr>
<td>Cyclo Retinoscopy</td>
</tr>
<tr>
<td>+3.00 sph</td>
</tr>
</tbody>
</table>

Case History

The 8 year old male presents for blur especially at near. sc 16 Δ EP (possible IET) with current +1.50 = 10 Δ EP. With +3D trial frame close to chart, slight reduction in VA with full +3, cyle with 0.5% spray yields +2.75 - 3D hyperopia. Rx increased to +2.25 today.

Consider re-evaluate & posture with Rx at start of day vs end of school day. Consider need for ADD.

Assessment / Plan

- Convergence excess well controlled with Rx
  - sc 16 Δ EP (possible IET)
  - with current +1.50 = 10 Δ EP
  - with +3D trial frame close to chart
  - slight reduction in VA with full +3, cycle with 0.5% spray yields +2.75 - 3D hyperopia
  - Rx increased to +2.25 today.
  - Consider re-evaluate & posture with Rx at start of day vs end of school day.
  - Consider need for ADD.
  - Consider SCL as FTW of plus is necessary, patient very resistant.

- Hyperopia
  - Rx given patient has superb acceptance of plus and relies on plus Rx heavily.
  - Accommodative Insufficiency resolved.
  - Patient in 2nd grade, doing quite well in school.
  - Note reading fluency is struggling.
  - History of accommodative and skidctor therapy.
  - Patient currently undergoing full neuro psych test battery to identify reading deficiency.

Summary thus far....
What visual diagnosis do we see in these patients?

Uncorrected Refractive Error
Significant uncorrected hyperopia
Revealing itself over time

Accommodative Disorders
Significant accommodative insufficiency

Binocular Vision Disorders
Convergence excess

Ocular Motor Dysfunction
Significant

Patient heading to Neuro Psych Evaluation....

Parent concerns about 2nd grade performance
Some writing samples...

1st Grade - writing sample

My Uther makes me mad. He makes my life bitter. He has little order.
My other friends to help me... and I can be unkind.

Late 1st grade

Beginning: Tell about the characters and setting.
Middle: Tell about the problem.
Ending: Tell about the solution and the outcome.

2nd grade passage

Think ONE of the following topics and write a discourse-organized paragraph. Check the box of the topic that you choose.

- Tell me about an animal you can choose what animal to focus on.
- Would you rather live in a busy city or in a quiet village?
- Grade a story from this exercise whether it was playing in my room when suddenly my sister came in.

The Neuro Psych Evaluation....
**Diagnostic Evaluations**

- **Neuropsychological Evaluations** - The most comprehensive type of testing which analyzes multiple areas of functioning including those listed below.
  - Educational Evaluations - Analyzes academic areas of functioning, IQ, and sometimes information processing
  - Psychological Evaluations - Analyzes social and emotional areas of functioning
  - Intellectual Evaluations - Only IQ testing (usually for qualifications in gifted programs or advancement to higher grade levels)

**Neuropsychological Evaluations**

- Neuropsychological evaluation is an assessment of how one’s brain functions, which indirectly yields information about the structural and functional integrity of your brain.
  - The neuropsychological evaluation involves an interview and the administration of tests. The tests are typically pencil and paper type tests.
  - Standardized
  - Neuropsychological tests evaluate functioning in a number of areas including:
    - Intelligence
    - Executive functions (such as planning, abstraction, conceptualization)
    - Attention
    - Memory
    - Language
    - Perception
    - Spatio-motor functions
    - Motivation
    - Mood state and emotion
    - Quality of life
    - Personality styles

**During Neuro Psych Evaluation....**

**8 year, 2 month old male (6)**

**Case History**

- In 2nd grade, follow up after increase of hyperopic Rx

<table>
<thead>
<tr>
<th>Distance Visual Acuity</th>
<th>LE</th>
<th>RC</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/70 OD, 20/60 OS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Improves with time)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/50 OD, 20/40 OS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/30 OU</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cover Test</th>
<th>14 A EP rc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4-6 A EP rc</td>
</tr>
<tr>
<td></td>
<td>+2.25</td>
</tr>
<tr>
<td>Ortho rc</td>
<td>+2.75</td>
</tr>
</tbody>
</table>

| Dry Retinoscopy       | +3.00 sph  |
|                       | +3.00 sph  |
| Retinoscopy over Rx   | +0.50 sph  |
|                       | +0.50 sph  |
| MEM                   | plano      |
|                       | plano      |
Assessment / Plan

- Convergence excess and Hyperopia with significant headaches since increase in Rx (+1.50 → +2.25)
  - Add given +2.25 OU with +1.50 DUO blended bifocal

- Update
  - Took a week or 2 for patient to adapt to Rx
  - Minimal to NO headaches since dispense of Add

Uncorrected ametropia among children hospitalized for headache evaluation: a clinical descriptive study.

BACKGROUND:
Headache is a common complaint in children occasionally requiring hospital admission. The purpose of the present study was to analyze the prevalence of uncorrected ametropia in children with headache admitted to the hospital, and evaluate the importance of refractive assessment as part of their evaluation.

METHODS:
A retrospective review of children admitted to the Tel Aviv Medical Center for headache evaluation from December 2008 to March 2013, in whom the only abnormality found was an uncorrected refractive error.

RESULTS:
During the study period 917 children with headache were hospitalized for evaluation and 16 (1.7%) of them (9 boys, mean age 12 years, range 8-18 years) were found to have uncorrected ametropia.

BACKGROUND:
Headache is a common complaint in children occasionally requiring hospital admission. The purposes of the present study were to analyze the prevalence of uncorrected ametropia in children with headache admitted to the hospital, and evaluate the importance of refractive assessment as part of their evaluation.

METHODS:
A retrospective review of children admitted to the Tel Aviv Medical Center for headache evaluation from December 2008 to March 2013, in whom the only abnormality found was an uncorrected refractive error.

RESULTS:
During the study period 917 children with headache were hospitalized for evaluation and 16 (1.7%) of them (9 boys, mean age 12 years, range 8-18 years) were found to have uncorrected ametropia.

BACKGROUND:
Uncorrected ametropia is a possible cause of headache among hospitalized children. Therefore, complete ophthalmic evaluation, which includes proper refraction assessment, is important as it can identify a treatable headache etiology. Children without visual difficulty should be equally evaluated, as many children with headache and uncorrected ametropia do not have visual complaints.

I learned a new term used by academics

Twice Exceptional = Gifted children with learning disabilities

From the neuro psych report:

"In many instance people who struggle with visual tracking, scanning and sequencing difficulties also experience greater than usual learning problems"

“When an individual is gifted intellectually and struggles with a learning difficulty, both factors may be less observable or masked"
"Likely impacted by his visual scanning and sequencing difficulties"

"Application of his reading ability is substantially compromised because of the negative impact of his slow reading rate which is highly impacted by his visual scanning and sequencing difficulties and his interpretation varies with his attention. As he approaches reading a page, he appears to be excelling in much energy, just reading the text that by the time he reaches the end of the sentence he has sometime lost the meaning of the text in a whole. This has limitations with his ability to efficiently recall facts or make inferences from the material. When the text is complex requires more time to go back to the text to re-read for greater comprehension in order to respond to questions on tests."

Based on these findings his reading comprehension appears relatively average when he reads aloud since and reading context here in showing the pace of the reading and provides continuity feedback which might enhance recall via auditory-verbal memory.

Oculomotor Dysfunction

In summary, the level of functioning in reading is significantly below expectations with regard to the age and current academic performance at the present time. While his difficulties have persisted during his early educational years, it is inferred that his reading skills will progress and improve with intensive reading intervention and specific work on his visual, oculomotor challenges. These findings are consistent with a diagnosis of Specific Learning Disability with a deficit in Reading. P50 D, in accordance with the diagnostic criteria provided by the IDEA.

Reading
- Oral Reading: Comprehension - average range 50%
- Reading: Word Attack skills - average range 47%
- Silent Reading: Reading Recall - average range 72%
- Silent Reading: Comprehension - average range 43%
- Silent Reading: Sentence Fluency - average range 25%
- Oral Reading: Rate/Fluency - average range 25%
- Silent Reading: Word Reading Fluency - low average range 21%
- Reading: Word Identification - low average range 49%
- Broad Reading - low average range 18%

Writing
- Written Expression: Writing Fluency - average range 57%
- Written Expression: Writing Samples - average range 23%
- Written Expression: Spelling - low average range 23%
- Broad Written Language - average range 67%

Oculomotor Dysfunction

- Visual Scanning
- Visual Sequencing

Attention and Concentration
- Factors related to the Executive Functioning

Executive Functioning: Rating Scales

<table>
<thead>
<tr>
<th>Test/Procedure</th>
<th>Summary</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test A</td>
<td>Low</td>
<td>Impaired</td>
</tr>
<tr>
<td>Test B</td>
<td>Medium</td>
<td>Normal</td>
</tr>
<tr>
<td>Test C</td>
<td>High</td>
<td>Impaired</td>
</tr>
</tbody>
</table>

Coherence Analysis
- Factors related to the Executive Functioning

Executive Functioning: Rating Scales

<table>
<thead>
<tr>
<th>Test/Procedure</th>
<th>Summary</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test A</td>
<td>Low</td>
<td>Impaired</td>
</tr>
<tr>
<td>Test B</td>
<td>Medium</td>
<td>Normal</td>
</tr>
<tr>
<td>Test C</td>
<td>High</td>
<td>Impaired</td>
</tr>
</tbody>
</table>

Oculomotor Dysfunction

- Visual Scanning
- Visual Sequencing

Executive Functioning: Rating Scales

<table>
<thead>
<tr>
<th>Test/Procedure</th>
<th>Summary</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test A</td>
<td>Low</td>
<td>Impaired</td>
</tr>
<tr>
<td>Test B</td>
<td>Medium</td>
<td>Normal</td>
</tr>
<tr>
<td>Test C</td>
<td>High</td>
<td>Impaired</td>
</tr>
</tbody>
</table>
Saccades and fixations in children with delayed reading skills.

Abstract

PURPOSE: To assess the relationship between vision and reading outcomes in Indigenous and non-Indigenous schoolchildren to determine whether vision problems are associated with lower reading outcomes in these populations.

METHODS: Vision testing and reading assessment were performed on 50 Indigenous and 50 non-Indigenous schoolchildren in Queensland, Australia, divided into two age groups: Grades 1 and 2 (6-7 years of age) and Grades 6 and 7 (13-14 years of age). Vision parameters assessed were visual acuity, refraction, accommodative reserve, vergence accommodation, rapid automatized naming, and visual motor integration. The following vision conditions were then classified based on the score obtained: uncorrected hypertopes, convergence insufficiency, reduced rapid automatized naming, and delayed visual motor integration. Reading accuracy and reading comprehension were measured with the following reading tests: the effect of uncorrected hypertopes, convergence insufficiency, reduced rapid automatized naming, and delayed visual motor integration on reading accuracy and reading comprehension were investigated with ANCOVAs.

RESULTS: The ANCOVAs explained a significant proportion of variance in both reading accuracy and reading comprehension scores in both age groups, with WOR of the variance in reading accuracy and 25% of the variance in reading comprehension explained in the younger age group.

CONCLUSIONS: Reduced rapid automatized naming and visual motor integration were significant predictors of reading accuracy and reading comprehension scores in both age groups. Reduced reading skills were associated with reduced rapid automatized naming and delayed visual motor integration.

Abstract

PURPOSE: To determine the extent to which eye movements in children with delayed reading skills are associated with eye movements in children without delayed reading skills. These findings suggest that, in children with delayed reading skills, eye movements are not associated with eye movements in children without delayed reading skills.

RESULTS: Eye movements in children with delayed reading skills were significantly different to those obtained from children without delayed reading skills. The direction of the relationship was such that reduced reading skills were associated with reduced rapid automatized naming results. The vision parameters of visual motor integration and rapid automatized naming were significant predictors of reading accuracy.

CONCLUSIONS: Reduced reading skills were associated with reduced rapid automatized naming and visual motor integration. The fact that reduced rapid automatized naming and visual motor integration skills are more common in this group.

Abstract

PURPOSE: The purpose of the study is to determine whether the vision parameters of visual motor integration and rapid automatized naming are significant predictors of reading accuracy and reading comprehension scores in both age groups.

METHODS: The vision parameters of visual motor integration and rapid automatized naming were measured with the following reading tests: the effect of uncorrected hypertopes, convergence insufficiency, reduced rapid automatized naming, and delayed visual motor integration on reading accuracy and reading comprehension were investigated with ANCOVAs.

RESULTS: The ANCOVAs explained a significant proportion of variance in both reading accuracy and reading comprehension scores in both age groups, with WOR of the variance in reading accuracy and 25% of the variance in reading comprehension explained in the younger age group.

CONCLUSIONS: Reduced rapid automatized naming and visual motor integration were significant predictors of reading accuracy and reading comprehension scores in both age groups. Reduced reading skills were associated with reduced rapid automatized naming and delayed visual motor integration.

Abstract

PURPOSE: The purpose of the study is to determine whether the vision parameters of visual motor integration and rapid automatized naming are significant predictors of reading accuracy and reading comprehension scores in both age groups.

METHODS: The vision parameters of visual motor integration and rapid automatized naming were measured with the following reading tests: the effect of uncorrected hypertopes, convergence insufficiency, reduced rapid automatized naming, and delayed visual motor integration on reading accuracy and reading comprehension were investigated with ANCOVAs.

RESULTS: The ANCOVAs explained a significant proportion of variance in both reading accuracy and reading comprehension scores in both age groups, with WOR of the variance in reading accuracy and 25% of the variance in reading comprehension explained in the younger age group.

CONCLUSIONS: Reduced rapid automatized naming and visual motor integration were significant predictors of reading accuracy and reading comprehension scores in both age groups. Reduced reading skills were associated with reduced rapid automatized naming and delayed visual motor integration.
**Quickly screen patients for reading-related eye movement disorders with K-D Test Pro Reading**

**K-D Test Pro Reading** is an iPad-based program that allows clinicians to administer the King-Devick Test to patients during annual exams or vision screening events.

You need:
- Large iPad
- K-D Test Pro Reading App
  - automatically compare test results with age-related normative data in speed and accuracy
  - Quick
  - K-D Test Pro Reading can be easily administered in two minutes or less
  - Patient performance immediately compared to age-related normative data for patients aged 6-14+ years old
  - K-D Test has been extensively researched and validated by peer-reviewed studies published in elite journals

---

**Treating these disorders:**

**Reading Plus**
Diagnosing and Treating these disorders:

Right Eye

Training Games

RightEye Basic Training Game™ is customized to children once have identified with RightEye Easy Test™. Reports show scores for speed and accuracy. Play prepared exercises to track and assess improvement over time.

RightEye Basic Training Game™ is designed to improve reading and learning skills working in a natural way with RightEye (Easy Test™). These exercises improve the endurance skills and developing ties for improving a child’s reading and help aware from their eyes and improve their health to help achieving their goals in their academic progress with the help of the Gaming Software.

RightEye Deluxe Test™ exercises include and alternate at every angle, making the child’s brain more flexible and better at switching from one task to another. This is a form of development and rehabilitation. Exercises are easily adjustable to the child’s level and skills.

RightEye Deluxe Test™ exercises are used as a test during reading and learning. They are designed to improve the child’s visual skills, including eye tracking and eye coordination.

What are the benefits of RightEye Easy Test™?

See what your child sees...

What is the benefits of RightEye Easy Test™?

See what your child sees...
The Summary

Common History ↔ Compare to case we reviewed
From an insurance review
7 year old 5 month female

- Asthenopia and blur distance and near
- Difficulty reading
- Words seem to “jump” or “float” on the page
- Loses her place
- Skips lines
- Better comprehension when read to vs visual input
- Will read last letter of the word LEFT as the 1st letter of the word FELT
- Reading tutor x 4 months, now reading at grade level
- Struggles with spelling does not retain the words once learned
- Reverses letters and numbers occasionally
- Handwriting messy and poorly spaced / inconsistent sizing
- Trouble putting thoughts on paper
- Does well in math with exception of story problems and timed tests
- Coordinated in regard to athletics

What is our role as optometrists?

Uncorrected Refractive Error
Significant uncorrected hyperopia
Revealing itself over time

Accommodative Disorders
Significant accommodative insufficiency

Binocular Vision Disorders
Convergence excess

Ocular Motor Dysfunction
significant

The Neuro Psych Evaluation...

- Overall intellectual potential in 95<sup>th</sup> percentile
- Twice exceptional - gifted child with reading disability
- Low assessment scores in most areas of reading and writing
- Visual scanning and sequencing difficulties play a large role in the reading disability

Our visual perceptual evaluation can be the starting point for this...

Treatment

- Optometric
  - Spectacles / Duo blended bifocal / transitions
  - Spherical daily wear SCL for sports
  - Spherical daily wear SCL with bifocal as needed
  - Bifocal contact lens
  - Completed several rounds of Vision therapy to address: Accommodative, vergence and ocular motor deficiencies
- Reading Plus program
- Teacher awareness
- Reading tutor weekly
- Audio assistance

Reading Plus Program

Results

Started in February:
Start point at 50 wpm

Currently 7 months later:
Reading at 144 wpm
What is Dyslexia?

a general term for disorders that involve difficulty in learning to read or interpret words, letters, and other symbols, but that do not affect general intelligence

What is Dyslexia?

- Dyslexic children and adults struggle to:
  - read fluently
  - spell words correctly
  - learn a second language,
  - ...among other challenges.

But these difficulties have no connection to their overall intelligence.

Dyslexia is an unexpected difficulty in reading in an individual who has the intelligence to be a much better reader.

Questions ??...... Thank You

vkattouf@ico.edu
312-949-7279