A Novel Contribution to the Optometric Rehabilitation of Amblyopia

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Goals

- To define ambient visual processing
- To discuss the importance and extent of ambient visual processing
- To distinguish the difference between ambient visual processing and peripheral visual processing
- To demonstrate how treatment of ambient visual processing affects focal processing in relation to amblyopia
Objectives

To be able to:

- understand what ambient visual processing encompasses
- recognize how ambient visual processing interacts with focal processing
- appreciate the full scope of care that optometry represents
Case Information

- 4.5 year old WL went to an ophthalmologist for a mandatory eye evaluation before kindergarten where they discovered a lazy eye.

- He came to the Mind-Eye Connection for a 2nd opinion on treatment options.

**EYESIGHT**

<table>
<thead>
<tr>
<th>Distance</th>
<th>Near</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>L</td>
</tr>
<tr>
<td>20/50</td>
<td>20/20</td>
</tr>
<tr>
<td>struggling</td>
<td>effortlessly</td>
</tr>
</tbody>
</table>

**RETINOSCOPY (gross findings)**

<table>
<thead>
<tr>
<th>Distance</th>
<th>Near</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>+3.25</td>
<td>+2.75</td>
</tr>
<tr>
<td>L +2.75</td>
<td>L +1.75</td>
</tr>
</tbody>
</table>

**REFRACTION**

- R +1.50 sphere 20/40 BVA (Pinhole No Improvement)
- L +0.75 sphere 20/20
Habitual eye position and range of tolerance

- Habitual extraocular muscle position
  Distance: 2 exophoria
  Nearpoint: 6 exophoria
  Vertical: orthophoria

- Habitual intraocular muscle position
  Accommodative Lag
    R +3.75
    L +1.75

  Pupils: 4 mm

- Ranges of tolerance
  Aiming:
    Distance
    Suppressed (non-amblyopic) left

    Nearpoint
    BO x/24/18
    BI x/18/6

  Focusing on a 20/50 target at 14 inches
    R +2.25 to +1.50
    L +3.00 to -4.00
    Both +3.00 to +0.50 with difficulty
Testing methods

- Patient stationary, target stationary
  - Unable to accurately localize sounds on Z-Bell testing
  - Stereopsis was achievable, but with significant effort

- Patient stationary, target moving
  - Padula visual midline test accurate horizontal and vertical
  - Following target and thinking

- Patient moving, target stationary
  - Spatial Orientation was poor.
  - Residual asymmetric tonic neck reflex present
  - Standing on L foot, arms out to balance; on R foot very wobbly
  - Couldn’t hop on his right foot
  - Dominant (right) hand and arm held tightly to his side when trying to skip

- Patient moving, target moving
  - Patient can’t catch ball easily
Additional History & Findings

- Normal
  - eye health
  - full range of motion of extraocular muscles,
  - smooth pursuits
  - confrontation field,
  - color vision
  - tactile pressure

- Currently on Zyrtec
- Kidney reflux during first year of life
- Tubes in ears during second year of life
- Broken right collarbone (in sling for 8 weeks) at age 3 and a half
Central eyesight
Central Eyesight and Intentional Movement
WL’s Eyesight & Focal Visual Processing

- Central eyesight in WL was not balanced.
- Accommodation was sluggish.
- His broken collarbone restricted his arm movement and probably his eye movement.
- Intentional control of large muscles was difficult, so at this stage, lenses (for central eyesight) would not be first choice.
Peripheral Visual Processing
Non-visual pathways
Proprioceptors
ambient visual processing
More than eyesight
WL’s treatment options

- **TREATING SYMPTOMS**
  - Lens for eyesight.
  - Patching for eyesight development

- **DEVELOPMENT OF conscious movement**
  - Intentional eye movement activities to develop eye motor control, first monocularly, then binocularly
  - Stimulation of gross motor control

- **NON-Conscious ambient visual processing**
  - Passive alteration of visual environment to non-consciously modify habitual peripheral visual processing
WL’s choice

- Treatment chosen working with the non-conscious ambient processing rather than the conscious focal
WL’s initial treatment plan

- Shoulder stimulation games and
- Passive peripheral eyesight stimulation
- ATNR activity
- Ball bouncing
- Wheelbarrow moving head
- Arm and shoulder activity
- Follow up in 3 weeks
WL’s progress

Measurements

Visit 2  February, 2009
- +1.00 sphere OU with 20/25 R
- Perceives SILO at near
- Stands better on R foot

Visit 3 April, 2009
- +0.50 sphere 20/20--
- +0.75 sphere
- Saccadic fixations 48/33

Visit 4 July, 2009
- Plano sphere 20/20 strained
- Plano sphere 20/20 easily
- Saccadic fixations 29/27
- Lag +1.25 Right eye
- Accom range +2.50 to -3.00

Recommendations

- +0.62 sphere eyeglasses were prescribed 4 hours per day
- Patch left eye with 0.4 Bangeter filter 20 minutes per day.
- Continue working with hopping. Standing was excellent, as was ATNR recipient
- Discontinue glasses and patch
Conclusion

- Many amblyopes need visual therapy to regain functional usage of central eyesight used in focal processing.

- But, in WL’s case, focal visual processing was indirectly addressed by remediating ambient visual processing:
  - developing bilaterality with shoulder and hopping activities
  - structured changes in his environment
Did we achieve the intended goals?

- defined ambient visual processing
- discussed the importance and extent of ambient visual processing
- distinguished the difference between ambient visual processing and peripheral visual processing
- demonstrated how treatment of ambient visual processing affects focal processing in relation to amblyopia
Were the objectives met?

- Are you able to:
  - understand what ambient visual processing encompasses
  - recognize how ambient visual processing relates to focal processing
  - appreciate the full scope of care that optometryrepresents
Take home points

- Ambient visual processing continues to make optometrists unique practitioners because we can evaluate much more than central and peripheral eyesight.

- As of 1996, visual processing has been documented in over 300 visual pathways involving 47 cortical areas. The continual discovery of new retinal connections and retinal cell types allows for optometry to evolve.

- One way that we, as optometrists can alter focal processing is by stabilizing non-conscious ambient visual processing with our tools (i.e. lenses, prisms, filters, activities, etc)
Time for Questions and Thank Yous