Vision and Therapeutic Filters

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Outline

- Properties of Filters
- Selecting and Prescribing Filters
- Uses of Filters
  - Ocular Disease
  - Brain Injury
Properties of Filters

Activity

- Small Groups (Max 5-6)
- Trial Filters
- How does each filter change your perception?
- How do they make your eyes feel?
Properties

- Filters can act to:
  - Minimize symptoms of photophobia
  - Reduce glare
  - Enhance contrast
  - Improve brightness?
  - Change perception of colour
Minimize Symptoms of Photophobia:

- Darker coloured tints
- Prevent light entering visual system
- Neutral Density Filters (greys) do not change colour perception (reduce all wavelengths of light)

https://www.imagen-estilo.com/images/Newsimages/nd2_Full.jpg
Minimizing Glare:

- Filters that reduce the transmittance (or greater absorbance) of shorter wavelengths of light are thought to be helpful to reduce symptoms of glare.

How

- Theory: Shorter wave lengths of light contribute to more light scatter, increase in light scatter contributes to symptoms of glare
- Reducing short wavelengths, reduce glare

The true ‘blue-blocker’

<table>
<thead>
<tr>
<th>Color</th>
<th>Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>violet</td>
<td>380–450 nm</td>
</tr>
<tr>
<td>blue</td>
<td>450–495 nm</td>
</tr>
<tr>
<td>green</td>
<td>495–570 nm</td>
</tr>
<tr>
<td>yellow</td>
<td>570–590 nm</td>
</tr>
<tr>
<td>orange</td>
<td>590–620 nm</td>
</tr>
<tr>
<td>red</td>
<td>620–750 nm</td>
</tr>
</tbody>
</table>
450 (Yellow)

450x

527 (Orange)

550 (Red)

Enhance Contrast Sensitivity

- Similar theory to that for reducing glare
  - Somewhat linked to glare? Glare disability impacts contrast sensitivity.
  - Shorter wavelengths of light increase frequency, increase light scatter
  - Decrease shorter wavelengths, clean up retinal image, improve contrast
    - Eliminate noise
  - Consider yellows, oranges


Improve brightness?

- Those filters that block/absorb shorter wavelengths of light allow for slight pupil dilation
  - Leads to more light in system and appearance of greater brightness
- Yellows, light orange

Selecting and Prescribing Filters

- Marriage between knowledge and trial
  - Know impact of ocular disease on function
  - Understand which colour family to start
  - Trial and error from there....

https://freerangestock.com/sample/80580/knowledge-lightbulb-shows-know-how-and-wisdom.jpg
Low Vision and Medical Filters
Cataract

- What is it?
  - Yellowing/thickening of the crystalline lens which is normally a clear structure which helps focus light entering the eye on the retina at the back of the eye
Cataract

- Symptoms
  - blurry/hazy vision
  - difficulty reading or recognizing faces
  - altered colour perception
  - increased sensitivity to light and glare
  - difficulty driving particularly at night
Diabetic Retinopathy

- What is it?
  - New blood vessel growth on the retina which causes bleeds and fluid build up
  - Secondary to systemic diabetes that is not well controlled
  - May still occur if long-term insulin-dependent even if well controlled
  - May cause glaucoma
  - Also associated with premature cataracts
Diabetic Retinopathy

- Effects on vision
  - Decrease in vision
  - Decreased contrast sensitivity
  - Fluctuating refractive error (prescription)
  - Sudden loss of vision (if bleed into vitreous)
  - May have trouble with night vision
  - May experience double vision
Macular Degeneration (AMD/ARMD)

- What is it?
  - Affects central vision, peripheral or side vision remains intact.
  - Affects the macula area, a light sensitive tissue lining the back of the eye in the central area of the retina.
  - The entire retina lets you see that there is a book in front of you, the macula lets you see what is written in the book.
Types of AMD

- DRY (non-exudative) Macular Degeneration

- WET (exudative) Macular Degeneration
Dry AMD symptoms

- Fluctuating quality of vision
- Reduced clarity of vision, difficulty reading & distinguishing colours
- Difficulty adjusting to different lighting
- Central blind spots and distortion
- Decreased contrast sensitivity and problems with glare
Wet AMD symptoms

- Distortion – an early symptom of wet AMD
- Central blind spot
- Markedly decreased contrast sensitivity and acuity
- Decreased colour perception
- Problems with glare
Albinism

- Oculocutaneous (4 types) and Ocular albinism
- Defect of melanin production causing little or no pigmentation in eye, skin, and hair
- Resulting in visual symptoms:
  - Lack of eye pigments
  - Impaired visual acuity
  - Nystagmus – involuntary eye movement
  - Strabismus – eye turn
  - Sensitivity to bright light
  - Impaired visual depth perception
Albinism
Aniridia

- It means iris hypoplasia or lack of development of much of the iris
- However, also will have macular and optic nerve hypoplasia, cataract and corneal changes
- Secondary glaucoma can occur
- Strabismus and nystagmus is likely
Aniridia

- Patients with aniridia experience
  - Reduced visual acuity
  - Photophobia (light sensitivity)
  - Reduced contrast sensitivity
  - Possible visual field defects
  - Decreased depth perception
What about Acquired Brain Injury????
What is ABI?

“Damage to the brain, which occurs after birth and is not related to a congenital or a degenerative disease.”

WHO Geneva 1996

http://braininjuryociety.com/information/acquired-brain-injury/what-is-abi/
Causes of ABI

- Trauma
- Stroke
- Infections
- Lack of Oxygen (Anoxia)
- Tumours
- Surgery
- Toxic Exposure

• SO...what’s the difference between ABI and TBI???
  • ABI is the umbrella term for all forms of brain injury following birth as indicated in the definition
  • Traumatic brain injury is one form of acquired brain injury
- ½ million living with an acquired brain injury
- 18,000 new cases added every year
- 30 times more common than breast cancer and 400 times more common than HIV/AIDS.
AND

- 26% of those with ABI reported trouble with their vision most of the time...

The OBIA Impact Report 2012
https://www.ontario.ca/img/ontario@2x-print.png
Following a neurological event...

- Typical visual symptoms following a brain injury include:
  - Blur (sometimes intermittent)
  - Double vision
  - Difficulty tracking
  - Trouble focusing
  - Glare sensitivity and photophobia
May also report:

- Eye strain/fatigue
- Headaches
- Slow visuomotor performance
- Difficulties with balance and posture

Yes...but how do they work????