Goals/objectives

• Review various oculomotor and vestibular changes associated with Parkinson’s disease (PD) and other parkinsonisms

• Discuss the role of the vestibular therapist

• Review basic home exercises for maintaining ocular mobility
Ocular (Eye) movements defined

- Smooth pursuits: eye movements that allow a person to track a moving object
- Saccades: quick eye movements that bring objects from a person’s peripheral vision to their central vision
- Convergence: an eye movement that allows a person to focus on targets at varied distances

Vestibular (inner ear) functions defined

- Gaze stability or Angular VOR (vestibular ocular reflex): a function of the semicircular canals (a part of the inner ear) that enables a person to keep their vision on a target while the head is in motion
- Linear VOR: a function of the otolith organs (another portion of the inner ear) that helps a person to process linear movement and maintain a stable visual world when walking (i.e. riding on an elevator or a moving sidewalk)
Ocular/Vestibular changes: PD
(Parkinson’s disease)

- Impaired smooth pursuits\(^4,6\)
- Convergence insufficiency\(^4\)
- Impaired saccades:\(^4,6\)
  - Hypometric/undershooting
  - Delayed
  - Slowed
  - Reduced reflexive saccades

- Other changes:\(^1\)
  - Blepharospasm, reduced blink, apraxia of lid opening
  - Vestibular dysfunction\(^3\)
    - Otolith dysfunction
    - Impaired vestibular processing
    - Impaired subjective vertical

Ocular/Vestibular changes: PSP
(Progressive Supranuclear Palsy)

- Slowed saccades
- Impaired vertical saccades
- Vestibular impairments\(^3\)
  - Otolith dysfunction, specifically the saccule
    - Contributes to postural instability (reduced vestibulospinal response)
  - Impaired angular VOR (late disease)
  - Overactive VCR (vestibulocollic reflex)
Ocular/Vestibular changes: MSA
(Multiple System Atrophy)

- Impaired smooth pursuits\(^5\)
- Hypometric saccades\(^5\)
- Vestibular dysfunction\(^3\)
  - Noted more often in MSA-C
  - Otolith dysfunction
  - Impaired VOR suppression

Ocular/Vestibular changes: CBD/CBS
(Corticobasal degeneration or syndrome)

- Impaired smooth pursuits\(^2\)
- Increased saccadic latency\(^1,2\)
- Blepharospasm\(^2\)
- Apraxia of lid opening\(^2\)

[https://www.hxbenefit.com/blepharospasm.html](https://www.hxbenefit.com/blepharospasm.html)
Ocular/Vestibular changes: other dementias

- Frontotemporal dementia (FTD)
  - Impaired inhibition of reflexive saccades
  - Early saccades
  - Impaired visual suppression of VOR

- Dementia with Lewy Bodies (DLB)
  - Impaired reflexive saccades and complex saccade performance

Role of the vestibular therapist

- Identify areas for improvement (assessed via an oculomotor and basic vestibular exam)
- Provide exercises for a home program
- Incorporate areas for improvement into other unstructured oculomotor and vestibular tasks and exercises

https://ohns.ucsf.edu/balance-falls/vestibular-testing
Ocular exercises: smooth pursuits

• Have a family member shine a laser pointer on the wall in front of you, or move a pen or pencil, and track the object as it moves around

• Track road signs, stop lights, or other specific objects when riding in the car

• Eyecanlearn.com; youtube.com

• Applications for tablet

Ocular exercises: saccades

• Place 4 targets (make a square) on the wall
  • “Jump” your eyes side to side, up and down, and diagonally between the targets

• Eyecanlearn.com; youtube.com

• Applications for tablet
Ocular exercises: convergence

- Hold a pencil or pen upright out in front of you, and slowly bring it closer to the bridge of your nose, keeping both eyes on the object. Move as close as you can to the bridge of your nose while maintaining a single image.

- Hold the same pencil pointing toward you; try to jump your eyes from eraser to tip and back.

- Pick a target in front of you and watch it as you walk or ride closer to it, trying to keep a single image as long as you can.

Applications for tablets

- Eye exerciser
- Eye workout
- Eye workout: perfect eyesight
- Focus builder
- Schulte table
- Other game-based apps
References


Thank you!