Eye-Tracking Technology and Gaze Behavior During Dynamic Mobility Tasks in Neurological Populations

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**Background**
- Gaze behavior is altered secondary to neurological conditions
- Eye tracking technology (ETT) can monitor visual scanning behavior in static and dynamic environments
- No Prior systematic review on the use of ETT in neurological populations during mobility tasks

**Purpose**
- Determine how ETT has been used to assess and monitor gaze behavior during mobility tasks in neurological populations
- Examine findings within and between neurological populations
- Provide recommendations for clinical use and future research

**Methods**
- **Databases:** PubMed, Embase, and Web of Science databases were systematically searched
- **Inclusion Criteria:** Use of ETT during mobility tasks, neurological populations, Adults ≥ 18 years of age
- **Outcomes:** Visual scanning measures including saccades, visual fixations, and directional eye movement
- **Process:** 2 independent reviewers assessed abstract/full text for inclusion, performed data extraction, and assessed risk of bias

**Search Results**
- 8,030 articles identified, 16 included
- 11 in persons with Parkinson’s disease (PD)
- All conducted in laboratory setting
- 337 total participants, 88% with PD
- Other diagnoses: progressive supranuclear palsy, spinal cord injury, cerebellar degeneration, Alzheimer’s disease, and posterior cortical atrophy
- Walking, obstacle avoidance, dual-tasking, turning, stair negotiation, use of an elevator
- Visual fixations and saccades
- Eye-movement trajectory
- Intersegment timing of eye and body movements
- Methodological quality: 5 poor, 8 fair and 3 good/excellent

**Disease Specific Results**

**Parkinson’s Disease:**

**Gaze Behavior:**
- No dissociation of eye, head, trunk motions during turns
- Decreased anticipatory eye movement prior to turns
- Environmental scanning was decreased while walking

**Intervention:**
- Visual cues improved fixations during walking
- Deep brain stimulation improved saccade frequency and initial saccade velocity during turning

**Disease Severity:**
- Less voluntary eye movement during gait was associated with increased disease severity

**Conclusions**
- Use of ETT to track gaze behavior during a variety of mobility tasks is feasible in persons with neurological conditions
- Although studies have investigated gaze behavior during dynamic mobility tasks in large number of people with PD, more research is needed to identify patterns in other neurological populations
- Selected studies looked at mobility tasks in a laboratory setting with limited transferability to real-world settings

**Clinical Relevance**
- Measuring gaze behavior in PD can identify potential correlations and implications for mobility impairments
- Interventions in PD should address visual attention to the mobility task to improve task performance and potentially decrease risk for falls
- Potential for clinical integration of ETT with continued development of technology and reduction in cost
- Further research needed specific to use of ETT during mobility before implementation outside of PD population

For a full list of references please visit: