Supplementary Table 1. Studies showing relation of saccades/fixation and locomotor activities

Authors	Year	Participants	Technique	Method	Main findings	Conclusion
Gaze fixation and stepping						
Matthis et al.[126]	2015	12 healthy subjects (8 males, 4 females)	14-camera Vicon system, Sanyo PLC-XP45 projector for visual obstacles (Osaka, Japan)	Foot placement (stepping) task	Reduced stepping accuracy during the step to the previous target.	Visual information collected from previous step is required for a particular step.
Matthis and Fajen[127]	2014	10 healthy subjects (9 males, 1 female)	14-camera Vicon system, Sanyo PLC-XP45 projector for visual obstacles	Foot placement (stepping) task	Subjects collided with obstacles when vision was limited to less than two step lengths ahead.	Foot placement requires visual information from two step lengths ahead on complex terrain.
Yamada et al.[131]	2012	11 high-risk of falling (HR), 26 low-risk of falling (LR) older individuals, 20 younger individuals	Head-mounted eye tracker (EMR-9, Nac Image Technologies, Tokyo, Japan)	Multi-target stepping task	Fixation pattern different in young and older participants.	Fixations pattern in older participants creates difficulty in using visual information in a feedforward manner.
Marigold and Patla[128]	2007	7 young healthy adults (4 males, 3 females)	Head mounter eye tracker (Applied Science Laboratories, Bedford, MA, USA)	Foot placement (stepping) task with varying ground terrain.	Specific areas of gaze fixations	Fixations are required to maximize visual information
Patla and Vickers[130]	2003	7 healthy participants	Mobile eye tracker (Applied Sciences Laboratory, 3100H)	Foot placement (stepping) task with footprints	Fixation on average two steps ahead	Spatial-temporal relationship between stepping and gaze.
Hollands et al.[133]	2002	7 healthy young adults (3 males, 4 females)	Vision-In-Action system (VIA, Vickers 1996), Eye tracker (Applied Sciences Laboratory)	Straight walking and turning task	Saccade to align gaze with the end-point of the required travel path.	Eye and head movements in a coordinated fashion provides allocentric frame of reference.
Imai et al.[114]	2001	5 normal healthy subjects (4 males, 1 female)	Motion analysis system (Optotrak 3020; Northern Digital Inc., Ontario, Canada), ISCAN eye tracker (ISCAN Inc., Woburn, MA, USA)	Straight walking and turning task	Saccades in the direction of the turn	Eyes are directed by orienting mechanisms during turning.
Hollands et al.[196]	1995	8 normal healthy subjects (4 males, 4 females)	Infrared reflectometry and electrooculography	Foot placement (stepping) task with stepping stones	Saccades made for the next target of footfall	Visual information was mainly collected when the foot (to be positioned) was still on the ground.
Saccades and gait in cerebellar patients						
Marple-Horvat and Crowdy[192]	2005	4 patients with primary cerebellar degeneration (4 males)	Head mounted eye tracking system (ASL, Model 501, Applied Sciences Laboratory)	Foot placement (stepping) task with footfall patterns consisting of stepping stones	Dysmetric saccades to fixate footfall targets with corrective saccades	Saccades required for gaze transfer between targets and fixations.
Crowdy et al.[191]	2000	8 patients with primary cerebellar degeneration (6 males, 2 females)	Horizontal eye movement was recorded using both infrared reflectometry and electrooculography Simple logic circuits placed in the footwear used to record footfall	Foot placement (stepping) task with footfall patterns consisting of stepping stones	Dysmetric saccades to fixate footfall targets with corrective saccades	Interaction between eye pattern and stepping.
Saccades and gait in Parkinson's disease						
Stuart et al.[197]	2017	60 PD 40 healthy controls	Head-mounted infra-red monocular mobile eye-tracker (Dikablis, Ergoneers, Manching, Germany; 50 Hz) and bi- temporal electrooculography (EOG; Zerowire, Aurion, Milano, Italy)	Straight line walking Turning task Dual tasking when walking	Reduction of saccade frequency in PD	Indirect influence of saccadic impairments on gait
Ewenczyk et al.[181]	2017	30 PD (21 males, 9 females; presence or absence of postural control) 25 healthy controls	SMI video-based eye tracker (SensoMotoric Instruments, Berline, Germany) (500 Hz sampling rate) Neuroimaging: 3T Siemens TRIO 32-channel TIM system (Siemens, Erlangen, Germany)	Recordings for gait initiation Eye movement recordings using visually guided and antisaccades	Change in Antisaccade latencies in PD which correlated with postural control problem Normal healthy control showed that PPN-FEF functional connectivity correlated with antisaccade latency	Antisaccade parameter could be biomarker for gait impairments PPN involved in antisaccade and gait problems
Nemanich and Earhart[176]	2016	13 PD with freezing of gait (PD–FOG, 7 males), 13 without freezing (5 males), 12 controls (4 males)	Video-oculography system (Eye-Trac 6, Applied Science Laboratories)	Automatic pro-saccades and non-automatic anti-saccades	PD–FOG slower on saccades. Increased variability in gain and velocity	Freezing related to changes in eye movement control in PD-FOG as compared to patients with no freezing of gait
Ambati et al.[178]	2016	8 PD, 5 healthy older adults, 9 healthy young adults	Vicon Plug-In-Gait model (ViconPEAK, Oxford, UK) ASL eye-tracker (Applied Science Laboratories)	Walking and turning tasks under two visual conditions: free gaze and fixed gaze	No significant difference in timing between eye and head movement in PD unlike control group which showed significant difference	No anticipatory eye movements ahead of turning in PD Eye movements could be added to training programs for PD.
Walton et al.[177]	2015	15 PD patients (11 males, 4 females) with freezing of gait and 11 PD (9 males, 2 females) without freezing of gait	Saccadometer Advanced (Ober Consulting, Poznan, Poland), head-mounted device	Pro-saccade and anti-saccade task	Impaired anti-saccade performance by patients with freezing of gait	Link between freezing of gait and cognition.
Vitório et al.[117]	2014	19 PD (11 males, 8 females) 15 healthy controls	Wireless mobile eye tracker (Mobile Eye-XG, ASL, Bedford, MA, USA)	Self-paced gait under four conditions: 1. Normal walking 2. Without exproprioception 3. Visual cues 4. Visual cues without exproprioception	Fixation on visual cues by both groups. Gait parameters improved in PD under cued conditions	Visual information from cues required in feedforward manner.
Galna et al.[179]	2012	21 PD 12 healthy controls	Electrooculography (Zerowire, Aurion, Italy), 12-camera (Mx3+ VICON, Culver city, CA, USA)	Walking task with different environmental conditions	Saccadic frequency increased with turns. Less frequent saccades by PD prior to turn	Gait impairments contributed by improper visual sampling.
Lohnes and Earhart[180]	2011	23 PD (14 males, 8 females for 90 degree turns; 13 males, 7 females for 180 degree turns) 19 healthy controls	8 camera, (Motion Analysis Corporation, Santa Rosa, USA) (Applied Sciences Laboratory), Electrooculography	Turning task	PD performed more saccades. Impaired saccadic parameters during turn in PD	Role of saccade in turning.
Gait and saccade in older subjects						
Paquette and Fung[198]	2011	19 young (8 males, 11 females) and 12 elderly (4 males, 8 females) subjects	EyeLink I system (SensoMotoric Instruments, 250 Hz), Six-camera Vicon 512 system	Visual target tracking task with unpredictable target position. Participants performed task on a stable or moving surface.	Elderly subjects followed saccadic targets with less accuracy	Relationship between posture and accuracy of gaze responses.
Greany and Di Fabio[132]	2008	30 older adults (7 males, 23 females), 15 with history of fall (HR), 15 with no history of fall (LR)	Binocular infrared recording oculography system (standard model 501 Head Mounted Optics BIRO 2000, Microguide, Inc., Downers Grove, IL, USA).	Foot placement task	Difference between mean saccade-footlift latency between high-risk (HR) elderly and low-risk (LR) elderly	Saccadic timing and foot placement are associated with falls in older participants.
Di Fabio et al.[199]	2003	5 young 4 older subjects	An infrared oculography, Video-based motion analysis system (Peak Performance Technologies Inc., Denver, CO, USA)	Stimulus-response compatibility paradigm	Saccades during the stance phase and before target footlift in both groups	Successful obstacle avoidance requires optical flow disruptions.
Di Fabio et al.[200]	2003	4 older participants (1 male, 3 females) 5 younger participants (2 males, 3 females)	An infrared oculography, Video-based motion analysis system (Peak Performance Technologies Inc.)	Foot placement (stepping) task	Saccades prior to footlift in both groups	Downward saccade made to accommodate for processing delays in elderly subjects.
Saccades and gait in people under alcohol dose						
Crowdy and Marple-Horvat[138]	2004	6 healthy young adults	Infrared reflectometry Simple logic circuits placed in the footwear used to record footfall	Foot placement (stepping) task with stepping Task performed before consumption of alcohol dose and after consumption of alcohol dose	Inaccurate saccades made to stepping stones and impaired gait parameters after alcohol dose. Occurrence of missed footfall targets.	Subjects intoxicated (alcohol) reflected symptoms similar to patients with cerebellar dysfunction.
Saccades and gait in acrophobia						
Kugler et al.[136]	2014	16 subjects (5 males, 11 females) susceptible to fear of heights and 16 non-susceptible controls	Infrared eye-tracking goggles with a head-fixed scene camera Video recordings to correlate gaze and gait behavior.	Walking task; emergency escape balcony 20 meters above ground level.	Vertical saccades were preferred as compared to horizontal saccades.	Preference of vertical saccades during locomotion to avoid looking abyss helps reduce anxiety for better balance
Saccades and gait in anxiety						
Young and Hollands[134]	2012	87 year old female	Vicon MX (Oxford Metrics, Oxford, England, UK) ASL-500 head mounted gaze tracker (Applied Sciences Laboratory)	Walking task with stepping guides	Before fall: fixated on the stepping guide. After fall: consistently looked away from the stepping guide	Psychological and related behavioral factors can change in older adults following a fall.
Young et al.[135]	2012	17 older adults participants 9 high-risk, 8 low-risk of falling	Vicon MX (Oxford Metrics) ASL-500 head mounted gaze tracker (Applied Sciences Laboratory)	Walking task with stepping targets	In the high risk group early gaze transfer and increased inaccurate stepping	Stepping performances could be influenced by deficient visual sampling due to anxiety.

PD: Parkinson disease, PPN: pedunculopontine nucleus, FEF: frontal eye fields, PD-FOG: PD with freezing of gait