

Northumbria Research Link

Citation: Stuart, Sam, Lord, Sue, Galna, Brook and Rochester, Lynn (2018) Saccade frequency response to visual cues during gait in Parkinson's disease: the selective role of attention. *European Journal of Neuroscience*, 47 (7). pp. 769-778. ISSN 0953-816X

Published by: Wiley-Blackwell

URL: <http://dx.doi.org/10.1111/ejn.13864> <<http://dx.doi.org/10.1111/ejn.13864>>

This version was downloaded from Northumbria Research Link: <http://nrl.northumbria.ac.uk/41478/>

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: <http://nrl.northumbria.ac.uk/policies.html>

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)



Northumbria
University
NEWCASTLE



University**Library**

Table 1 - Demographic, cognitive, visual and clinical characteristics

		Control (n=32)	PD (n=55)		
		Mean (SD)	Mean (SD)	p	
Demographic	Age (years)	67.03 (10.80)	67.93 (7.86)	.657	
	Sex	15M / 17F	36M / 19F	.115†	
	Height (cm)	168.36 (10.12)	171.40 (9.10)	.153	
	Weight (kg)	73.98 (12.70)	82.98 (19.78)	.026*	
	Education (years)	14.63 (2.83)	13.24 (3.57)	.063	
	Depression scale (GDS-15)	0.78 (0.94)	2.56 (2.60)	<.001*	
	Falls efficacy scale (FES-I)	18.88 (2.34)	24.62 (8.21)	<.001*	
	Retrospective Falls (last 12 month)	0 (1)	1 (3)	.259	
	Corrective eye-wear	Yes 24 / No 8	Yes 35 / No 20	.344†	
Cognition	Montreal Cognitive Assessment	28.41 (1.24)	26.71 (2.18)	<.001*	
	Addenbrookes	95.13 (3.46)	89.87 (7.22)	<.001*	
	Attention	Power of attention	1274.22 (151.83)	1441.5 (258.84)	.001*
		Fluctuating attention	49.02 (9.65)	59.55 (14.42)	<.001*
	Executive function	Royals CLOX 1	13.50 (1.14)	12.75 (1.44)	.013*
		Visuo-spatial ability	Royals CLOX 2	13.72 (1.02)	13.44 (1.57)
	Judgement of line orientation		25.56 (3.98)	23.12 (4.87)	.019*
	Working memory	VOSP - Total	48.81 (1.06)	47.71 (3.59)	.095
		VOSP - Incomplete letters	19.38 (0.66)	19.09 (1.11)	.191
		VOSP - Dot counting	9.88 (0.34)	9.82 (0.51)	.577
		VOSP - Position Discrimination	19.56 (0.80)	18.80 (3.00)	.164
	Visual function	Max Digit Span Length (sitting)	6.56 (1.01)	5.69 (1.12)	<.001*
		Visual acuity (LogMar)	-0.07 (0.13)	0.03 (0.16)	.007*
	Contrast sensitivity (MarsCS)	1.64 (0.09)	1.55 (0.14)	.004*	
Clinical	Hoehn and Yahr stage	-	I (20)/II (30)/III (5)	-	
	Disease duration (months)	-	60.00 (24 to 90)‡	-	
	UPDRS part I	-	10.64 (5.19)	-	
	UPDRS part II	-	10.95 (7.27)	-	
	UPDRS part III	-	36.80 (14.22)	-	
	UPDRS part IV	-	2.47 (3.09)	-	
	FOGQ	-	3.58 (6.27)	-	
	LED	-	599.87 (402.56)	-	

[*significance level $p < 0.05$, LED= levodopa equivalent daily dosage, FOGQ = Freezing of gait questionnaire, VOSP= visual object and spatial perception battery, † = χ^2 , ‡ = Median and Inter-quartile range]

Table 2 - Saccade frequency determinants in Parkinson's disease

Task	Determinant	PD		Control	
		β	p	β	p
Δ CUE	Age	-.281	.097	.232	.410
	UPDRS III	-.294	.101	-	-
	MoCA	-.346	.057	-.055	.813
	GDS-15	.154	.326	-.139	.500
	FoA	-.348	.035*	.050	.859
	JLO	.209	.189	.061	.814
	CLOX 1	-.129	.411	-.067	.812
	Digit span	.190	.167	.125	.621
	VA	-.008	.961	.026	.917
CS	-.451	.033*	.199	.407	
Δ CUE-DUAL	Age	.121	.513	.300	.270
	UPDRS III	-.290	.143	-	-
	MoCA	-.010	.960	-.136	.544
	GDS-15	.080	.644	.183	.358
	FoA	-.077	.666	-.472	.090
	JLO	.116	.509	.455	.078
	CLOX 1	-.043	.804	-.241	.380
	Digit span	-.133	.379	-.104	.667
	VA	.120	.531	-.221	.359
CS	.066	.772	.051	.822	

[*significance level $p < 0.05$]

Table 3 – Structural equation model direct, indirect and total effects

Outcome	Predictor	Direct effect pathway	Indirect effect pathways			Total effect
		β (<i>p</i>)	Cognition β (<i>p</i>)	Visual Function β (<i>p</i>)	Saccade Frequency β (<i>p</i>)	β (<i>p</i>)
Gait						
	Cognition	-.367 (.036)*	-	-.023 (.774)	-.013 (.657)	-.403 (.034)*
	Visual Function	-.047 (.940)	-.168 (.005)*	-	.010 (.774)	-.205 (.073)
	Saccade Frequency	.054 (.602)	.098 (.031)*	.010 (.546)	-	.162 (.602)
Saccade Frequency						
	Cognition	-.267 (.037)*	-	.099 (.054)	-	-.168 (.045)*
	Visual Function	.217 (.113)	-.122 (.008)*	-	-	.095 (.782)

[*significance level $p < 0.05$, Direct effect pathway = path between Outcome and Predictor, Indirect effect pathways = path between Outcome and Predictor through x (where x represents either cognition, visual function or saccade frequency), Total effect = sum of all direct and indirect effects, β = standardised coefficient]