4° CONGRESSO NAZIONALE

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03 · 04 · 05
APRILE 2025

I disturbi della deambulazione

Silvio Peluso
UOC Neurologia e Stroke Unit
PO Ospedale del Mare – ASL NA1 Centro


Funzione propriocettiva
Funzione vestibolare
Funzione visiva
Integrazione sensori-motoria
Funzione motoria
Equilibrio
Riflessi posturali

Contoso

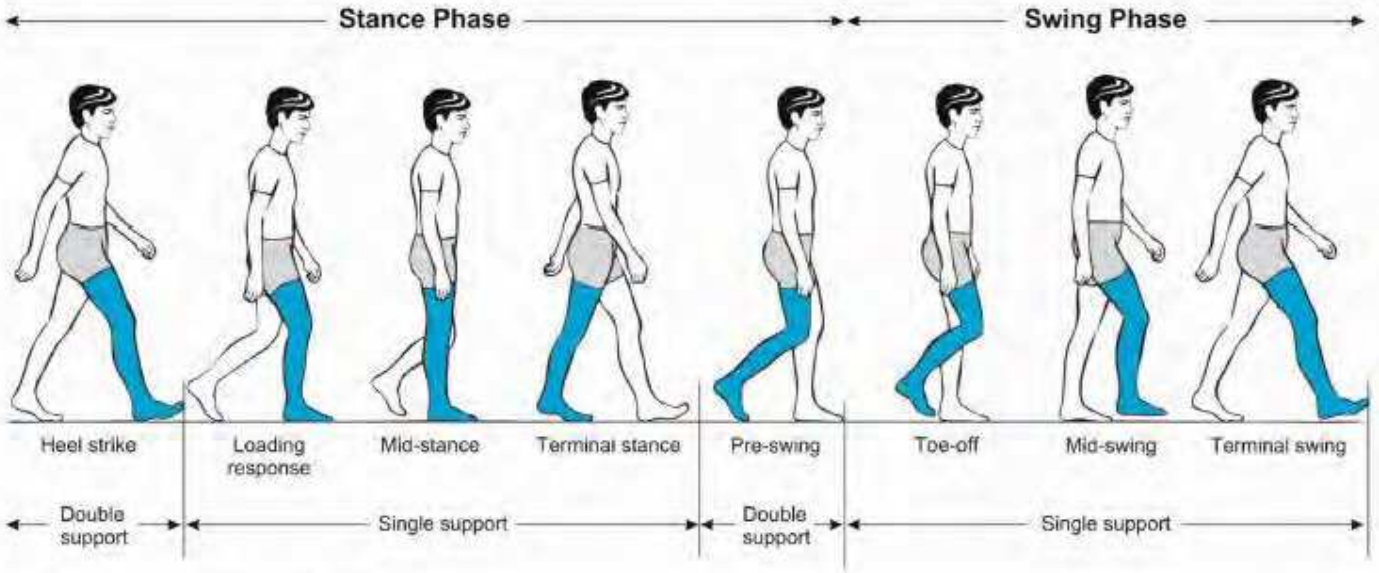
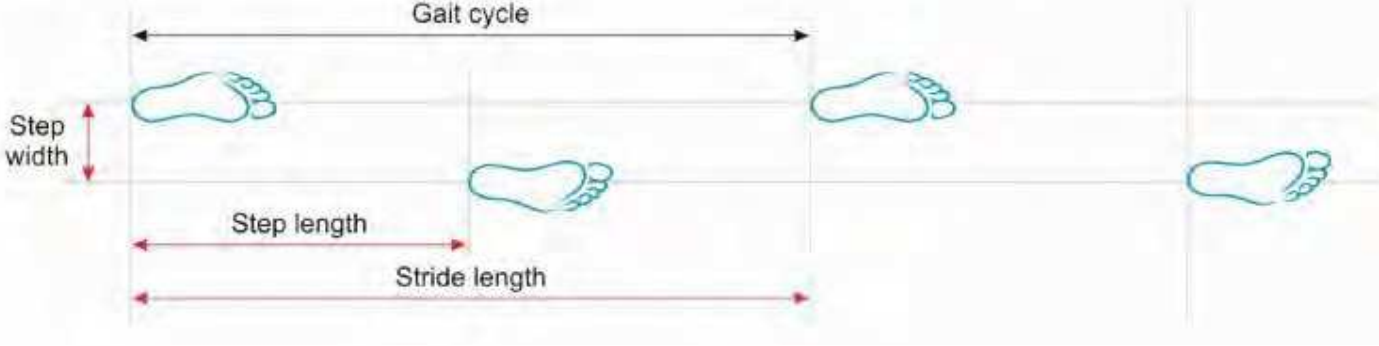
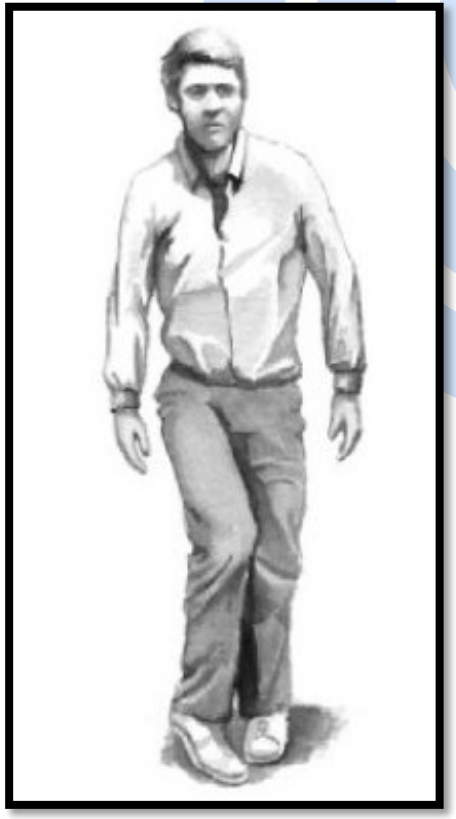


Fig. 1 Phases of the normal gait cycle



	19 - 59 anni	> 60 anni
Velocità di marcia	1,4 m/sec	↓
Lunghezza ciclo del passo	150-170 cm	↓
Cadenza	115-120 passi/minuto	=
Tempo di oscillazione		↓
Tempo di doppio appoggio	10-12%	> 26%






Deambulazione parkinsoniana

OPEN

Gait parameters of Parkinson's disease compared with healthy controls: a systematic review and meta-analysis

Ana Paula Janner Zanardi[1,2], Edson Soares da Silva[1], Rochelle Rocha Costa[1], Elren Passos-Monteiro[1,3], Ivan Oliveira dos Santos[1], Luiz Fernando Martins Kruel[1] & Leonardo Alexandre Peyré-Tartaruga[1]

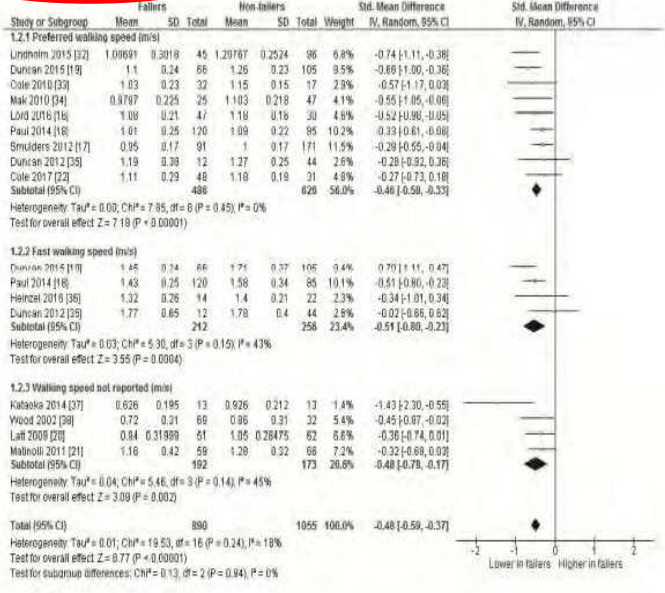
	PD *vs* HC		PD vs HC		PD *vs* HC
Velocità di marcia	- 0,17 m/sec	***Tempo di doppio appoggio***	+ 1,79%	***ROM anca***	- 5,29°
Lunghezza del passo	- 0,16 m	***Tempo di appoggio***	Nessuna differenza	***ROM ginocchio***	Nessuna differenza
Cadenza	+ 1,75 passi/minuto	***Tempo di oscillazione***	- 1,76% *	***ROM caviglia***	Nessuna differenza
Ampiezza del passo	nessuna differenza				

Parkinsonism & Related Disorders

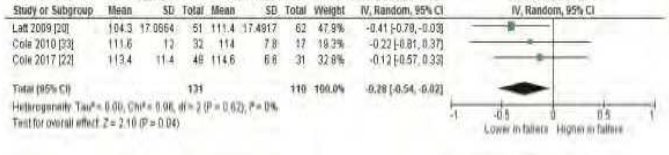
Gait characteristics and falls in Parkinson's disease: A systematic review and meta-analysis

Michael H. Cole

A: Walking Speed



B: Cadence

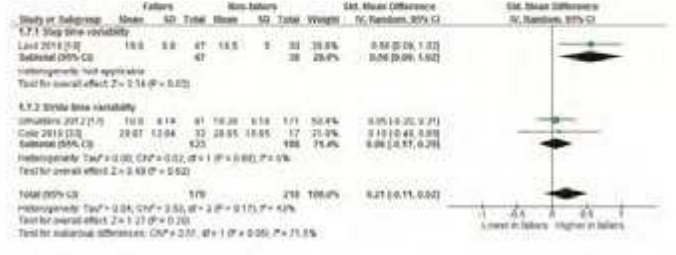


C: Step and stride length

D: Step width

E: Step and stride time

F: Step and stride time variability



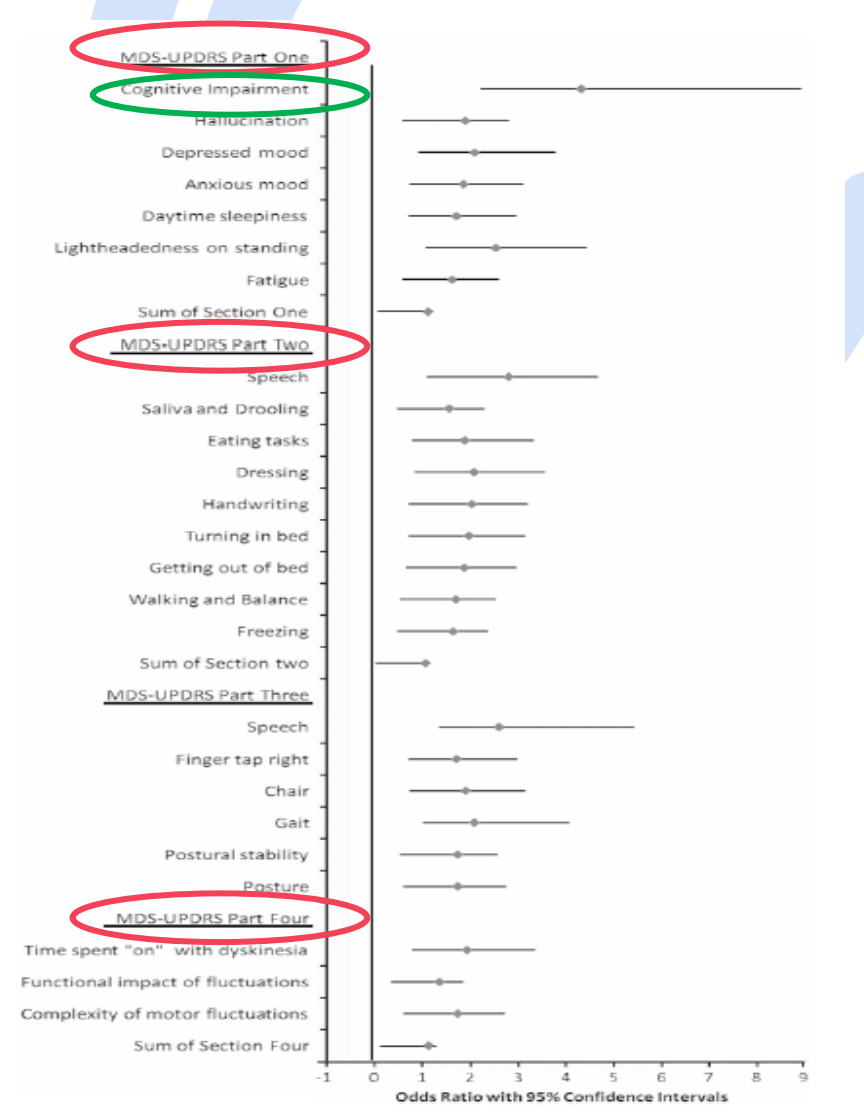
ARTICLE OPEN

Why do patients with Parkinson's disease fall? A cross-sectional analysis of possible causes of falls

Anette Schrag[1], Mahbuba Choudhury[1], Diego Kaski[1] and David A Gallagher[1]

Table 1. Demographics and motor and nonmotor scale scores between fallers and non-fallers

	Median (range) or Number (%)		P-value*
	Fallers (n=27)	Non-fallers (n=60)	
Demographics			
Age (years)	70 (58–83)	67.5 (44–86)	0.44
Disease duration (years)	10.8 (0.1–29.1)	4.1 (0–22.8)	0.005
Motor features			
MDS-UPDRS part III	36 (12–65)	34 (9–70)	0.24
Dyskinesia (% daytime)	6 (0–75)	0 (0–53)	0.005
'On' without dyskinesia (%)	76 (12–100)	100 (7–100)	0.006
'Off' time (%)	12 (0–56)	0 (0–54)	0.04
Hoehn and Yahr stage	3 (1–4)	2 (2–5)	0.018
Cognition			
SCOPA-COG-total	23 (9–32)	26 (6–39)	0.02
SCOPA-COG-memory	8 (3–13)	9 (1–18)	0.07
SCOPA-COG-attention	4 (2–4)	4 (0–4)	0.24
SCOPA-COG-executive	8 (2–12)	9 (2–12)	0.003
SCOPA-COG-visuospatial	4 (1–5)	4 (0–5)	0.25
Sleep			
PSQI	7 (2–19)	5 (1–18)	0.007
Epworth Sleepiness Score	11 (1–20)	5.5 (0–20)	0.04
Presence of RBD	13/27 (48%)	11/60 (18%)	0.004
Psychosis, apathy, fatigue, and depression			
SPRS	9 (6–14)	6 (6–15)	<0.001
Lille Apathy Rating Scale	−25 (−35 to −3)	−26.5 (−35 to −3)	0.30
Fatigue Severity Scale	4.6 (1.8–7)	4.0 (0–7)	0.06
HADS anxiety	7 (1–15)	4.5 (0–16)	0.06
HADS depression	6 (2–12)	4.5 (0–18)	0.11
Autonomic function			
SCOPA-AUT-total	18 (11–36)	10 (3–35)	<0.001
SCOPA-AUT-gastrointestinal	4 (1–8)	2 (0–10)	<0.004
SCOPA-AUT-urinary	7 (1–15)	4 (0–16)	0.02
SCOPA-AUT-cardiovascular	1 (0–6)	0 (0–3)	0.001
SCOPA-AUT-thermoregulatory	2 (0–11)	1 (0–10)	0.07
SCOPA-AUT-pupillomotor	1 (0–3)	0 (0–3)	0.001
SCOPA-AUT-sexual	3 (0–6)	2 (0–6)	0.14



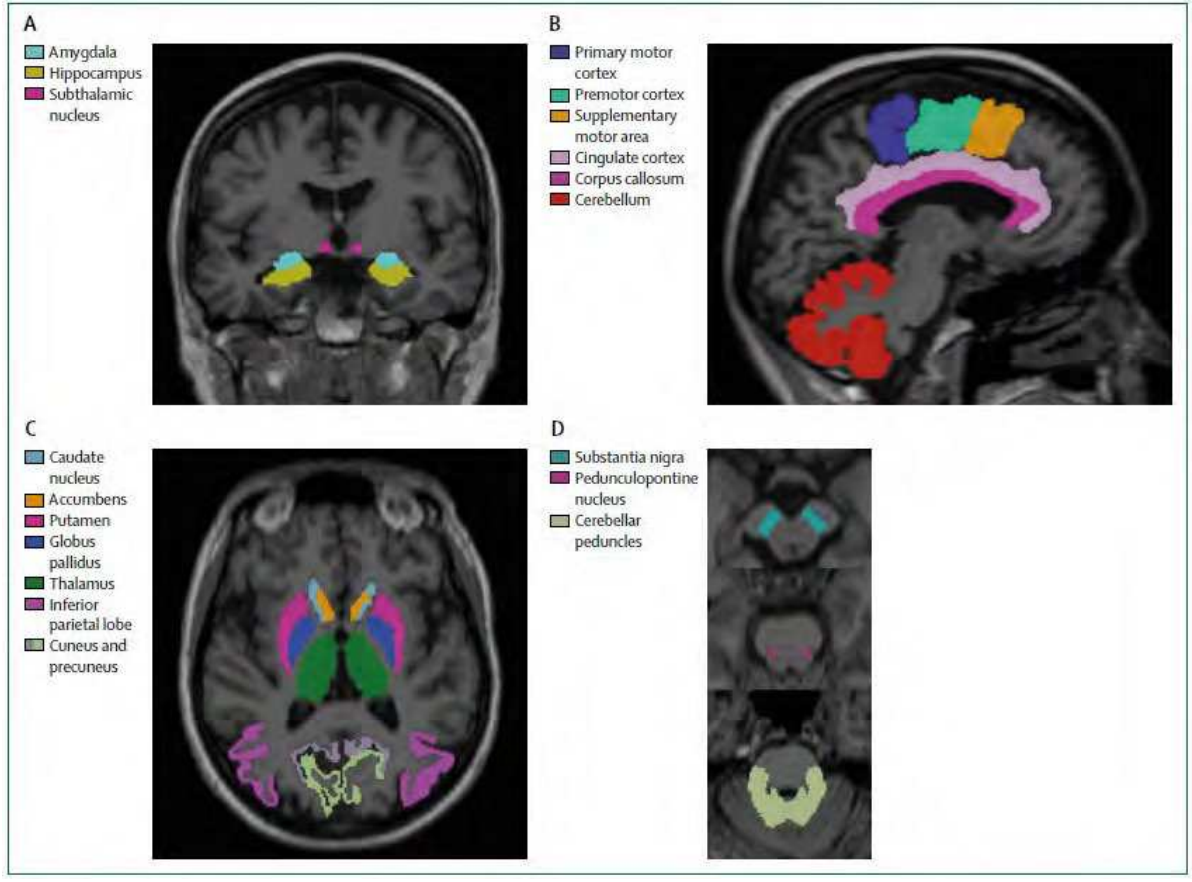
Postural instability and gait difficulty (PIGD) phenotype

- *Minore lunghezza del passo*
- *Minore velocità di marcia*
- *Maggiore instabilità*
- *Maggiore frequenza di cadute*

- *Esordio più tardivo*
- *Più veloce progressione*

- *Maggiore denervazione dopaminergica*
- *Minore risposta alla L-Dopa*
- *Maggior rischio di fluttuazioni motorie*

- *Maggiore frequenza di sintomi non motori*
- *Maggior rischio di problematiche cognitive*



Freezing of gait

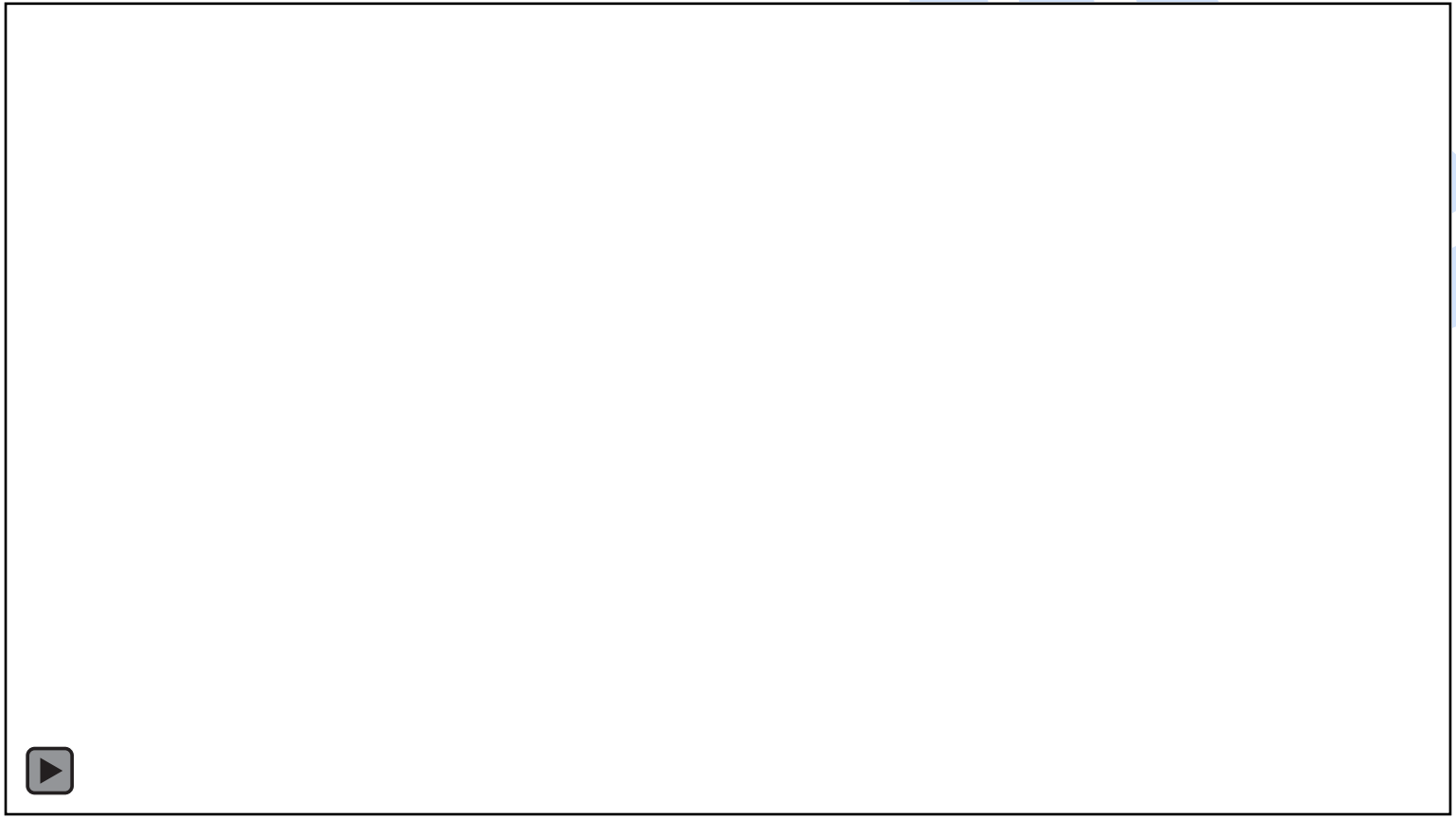
REVIEW Open Access

Freezing of gait in Parkinson's disease: pathophysiology, risk factors and treatments

Chao Gao[1], Jun Liu[1], Yuyan Tan[1*] and Shengdi Chen[1,2*]

Demographic risk factors		
Male sex	[16, 17, 25]	[18–24, 26]
Low education level	[22]	[19, 23, 24]
Onset age		[16, 17, 20–23, 25, 26]
Age		[18, 19, 21–25]
Baseline longer disease duration	[20, 23]	[16–19, 21][b]
Motor symptoms		
Gait disorders	[16–21, 23]	[22]
Motor phenotype	[16, 17, 21, 22]	[18, 19, 25]
Motor fluctuation	[21]	[23]
Balance, festination and falls	Festination and falls [23], balance [20]	Balance [19]
Non-motor symptoms		
Cognitive disturbance	[16, 17, 22–24]	[18–21]
Depression	[19, 20, 22]	[16, 23, 24]
Anxiety	[18]	[16, 23, 24]
Sleep	Insomnia [22], daytime sleepiness [24]	RBD [16, 18, 24], daytime sleepiness [16, 23]
Others	Speech problems [20], hallucination [23]	
Neuroimaging and fluid parameters		
Lower striatal DAT update	[16, 17, 25]	
White matter hyperintensities	[26]	
CSF Aβ42	[16]	
Medication use		
High LEDD	[21]	[18, 19, 23, 26]
Dopamine agonist		[22]

Festinazione



Journal of Neurology (2019) 266:426–430
https://doi.org/10.1007/s00415-018-9146-7

ORIGINAL COMMUNICATION

Gait festination in parkinsonism: introduction of two phenotypes

Jorik Nonnekes[1] · Nir Giladi[2] · Anasuya Guha[3,6] · Urban M. Fietzek[4] · Bastiaan R. Bloem[5] · Evžen Růžička[6]

Increased stride-to-stride variation	*Camptocormia*

ELSEVIER

Parkinsonism & Related Disorders

Parkinsonism and Related Disorders 7 (2001) 135–138

www.elsevier.com/locate/parkreldis

Gait festination in Parkinson's disease

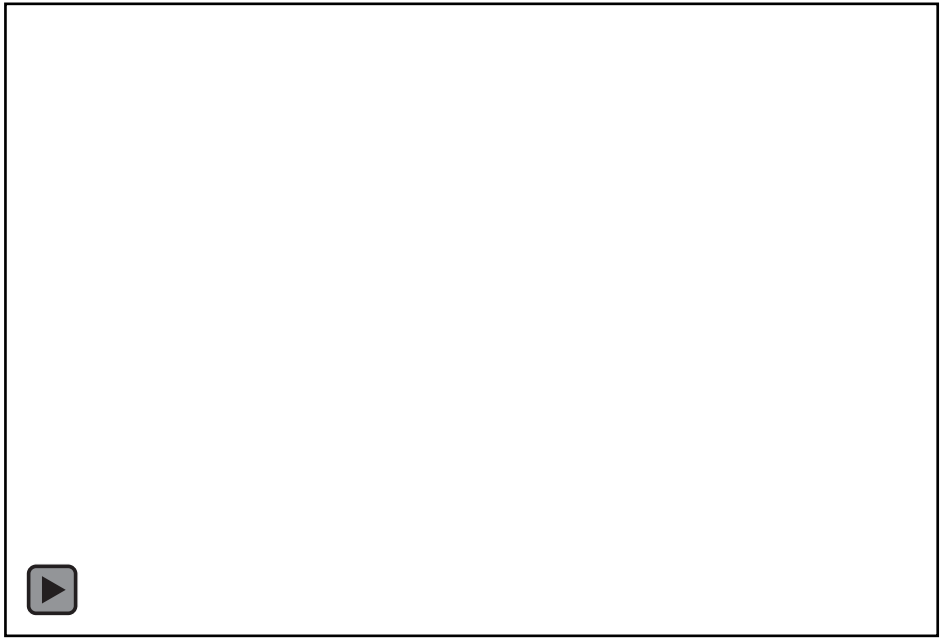
N. Giladi[a,b], H. Shabtai[a], E. Rozenberg[a], E. Shabtai[b]

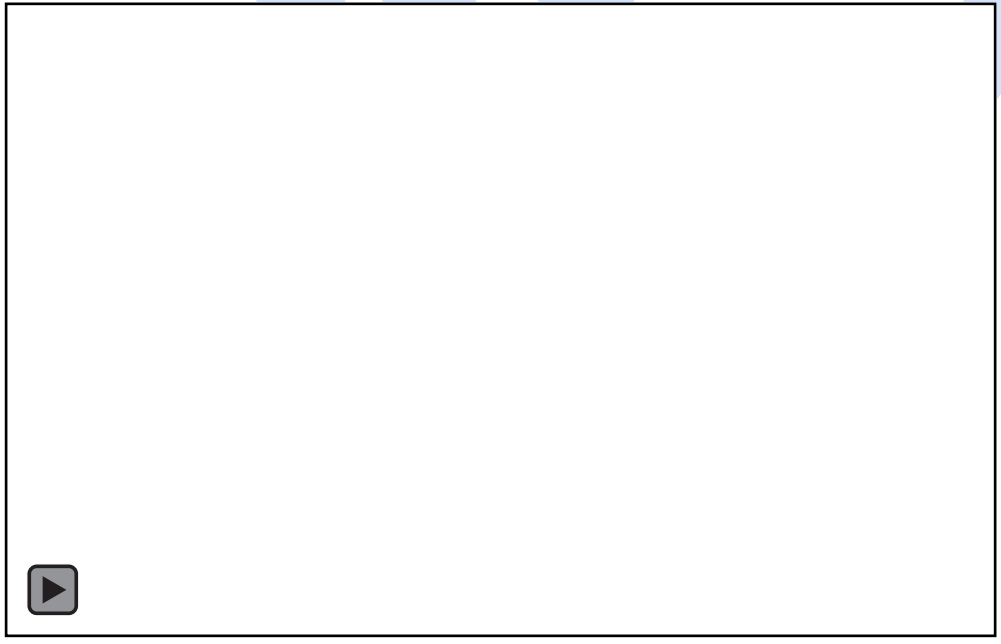
[a]Movement Disorders Unit, Department of Neurology, Tel Aviv Sourasky Medical Center, Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel
[b]Statistical Services, Tel Aviv Sourasky Medical Center, Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel

Comparison between patients with festination to those without festination of gait. (PD = Parkinson's disease, UPDRS = Unified Parkinson's Disease Rating Scale)

	FSG (+) $n = 26$ (32.1%)	FSG (−) $n = 55$ (67.9%)	t/χ^2 statistic	P
Mean current age (years)	66.7 ± 11.6 ($n = 24$)	67.9 ± 10.3 ($n = 54$)	0.446	N.S.
Mean age of symptoms onset (years)	54 ± 13.1 ($n = 24$)	61.2 ± 10.6 ($n = 54$)	2.58	0.012
Mean disease duration (years)	12.7 ± 7.4 ($n = 24$)	6.7 ± 5.0 ($n = 54$)	−4.2	0.001
Mean total levodopa dose mg/day	650.5 ± 529.3 ($n = 24$)	454.4 ± 332.4 ($n = 54$)	2.58	0.012
Hoehn and Yahr	3.8 ± 0.8 ($n = 24$)	2.4 ± 0.7 ($n = 54$)	4.21	0.0001
I	21% ($n = 5$)	43% ($n = 23$)		
II	13% ($n = 3$)	12% ($n = 12$)		
III	21% ($n = 5$)	28% ($n = 15$)	$\chi^2 = 18.2$	0.001
IV	46% ($n = 11$)	6% ($n = 3$)		
Total motor score of the UPDRS	30.2 ± 12.8 ($n = 24$)	29.5 ± 11.9 ($n = 48$)	−0.22	N.S.

Deambulazione cerebellare





Contents lists available at ScienceDirect

Gait & Posture

journal homepage: www.elsevier.com/locate/gaitpost

Full length article

A systematic review of the gait characteristics associated with Cerebellar Ataxia

Ellen Buckley[a], Claudia Mazzà[b,c], Alisdair McNeill[a,c,d,*]

	Cases			Controls			
	N	Mean Average ± SD	K	N	Mean Average ± SD	K	P value
Pace							
Speed (m/s)	281	0.91 ± 0.16	14	345	1.27 ± 0.15	12	< 0.01
Cadence (steps/min)	208	98.68 ± 10.85	10	267	111.97 ± 6.71	8	< 0.01
Spatial							
Step Length (m)	139	0.54 ± 0.09	7	251	0.68 ± 0.06	7	< 0.01
Stride Length (m)	94	1.17 ± 0.01	5	142	1.37 ± 0.04	3	0.01
Base Width (m)	192	0.17 ± 0.04	10	241	0.11 ± 0.03	8	< 0.01
Temporal							
Step Time (s)	42	0.63 ± 0.01	3	158	0.51 ± 0.02	3	0.01
Stride Time (s)	120	1.21 ± 0.06	7	177	1.03 ± 0.04	6	< 0.01
Gait Cycle							
Swing Phase (% cycle)	54	33.92 ± 3.44	4	146	39.25 ± 0.14	3	< 0.01
Stance Phase (% cycle)	57	65.99 ± 2.78	4	161	60.55 ± 0.22	4	< 0.01
Double Limb Support Phase (% cycle)	126	22.50 ± 6.77	7	170	16.76 ± 7.26	5	< 0.01
Variability							
Step Length Variability (%CV)	78	8.96 ± 1.94	5	184	3.07 ± 0.71	5	< 0.01
Stride Length Variability (%CV)	80	6.82 ± 1.70	4	142	1.95 ± 0.24	3	< 0.01
Stride Time Variability (%CV)	116	5.54 ± 1.05	6	187	2.24 ± 0.36	5	< 0.01
Speed Variability (%CV)	40	7.68 ± 4.31	3	148	3.46 ± 0.49	3	0.20

Cerebellum (2010) 9:232–239
DOI 10.1007/s12311-010-0155-z

Falls in Spinocerebellar Ataxias: Results of the EuroSCA Fall Study

Ella M. R. Fonteyn · Tanja Schmitz-Hübsch · Carla C. Verstappen · Laslo Baliko · Bastiaan R. Bloem · Silvia Boesch · Lisa Bunn · Perrine Charles · Alexandra Dürr · Allesandro Filla · Paola Giunti · Christoph Globas · Thomas Klockgether · Bela Melegh · Massimo Pandolfo · Anna De Rosa · Ludger Schöls · Dagmar Timmann · Marten Munneke · Berry P. H. Kremer · Bart P. C. van de Warrenburg

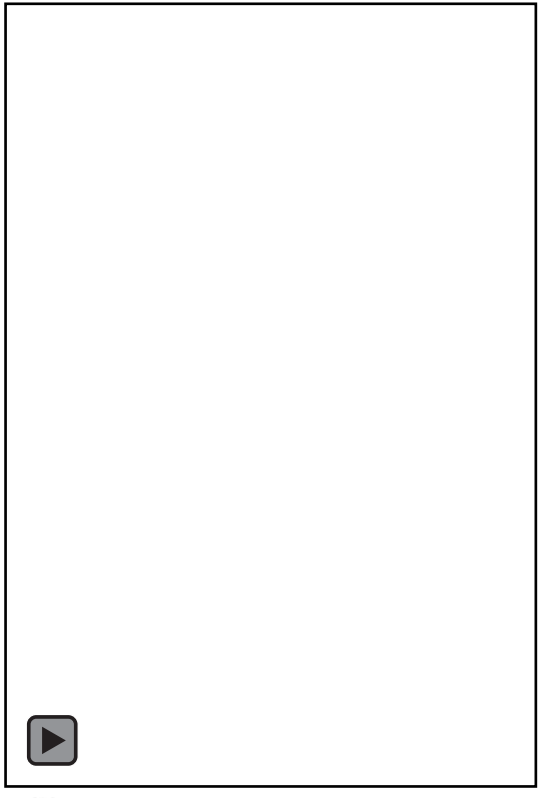
….. Patients (73.6%) reported at least one fall in the preceding 12 months. There was a high rate of fall-related injuries (74%) …..

Table 3 Differences between non-frequent fallers and frequent fallers

Item	Non-frequent fallers (n=141)	Frequent fallers (n=87)	Univariate logistic regression (Exp(B))	p value
Age (year)	52.6±15.1	51.7±12.4	0.995	NS
Men (%)	54.3	42.5	0.633	NS
Age onset of disease (year)	43.0±13.3	39.7±11.6	0.979	NS
Disease duration (year)	9.9±15.1	12.3±6.3	1.067	0.001
Genotype (%)				
SCA1	16.5	19.5	1.235	NS
SCA2	38.1	23.0	0.490	0.020
SCA3	18.0	36.8	2.551	0.003
SCA6	27.3	20.7	0.700	NS
Independent living situation (%)	83.6	81.6	0.995	NS
Living alone (%)	16.4	14.9	0.990	NS
Psychotropic medication (%)	33.1	39.1	1.312	NS
Antihypertensive medication (%)	29.4	25.3	0.821	NS
Impaired vision (%)	8.5	2.8	0.311	NS
Musculoskeletal pathology (%)	12.7	16.7	1.287	NS
SARA 1 "Gait"	3.4±2.3	4.9±7.0	1.187	0.001
SARA 2 "Stance"	2.3±1.7	2.7±1.4	1.145	0.038
SARA total score	14.3±6.6	16.0±6.4	1.032	0.012
INAS "Impaired vibration sense" (%)	66.4	59.7	0.742	NS
INAS "Impaired visual acuity" (%)	5.1	7.2	1.458	NS
INAS "Pyramidal" (%)	37.5	59.5	2.480	0.002
INAS "Neuropathy" (%)	38.7	49.4	1.566	NS
INAS "Ophthalmoparesis" (%)	47.1	48.8	1.088	NS
INAS "Extrapyramidal" (%)	9.5	1.2	0.232	0.020
INAS total score	3.7±2.0	4.9±2.4	1.299	0.001
First fall after onset disease (year)	4.9±4.8	4.3±4.9	0.976	NS
Measures to prevent falls (%)	82.5	83.1	0.954	NS
Injurious fallers (%)[a]	61.4	83.3	1.938	0.008
Walking without support (%)	58.1	35.6	1.952	0.003
Fear of falling (%)	56.5	65.5	1.373	NS
Restriction of activities (%)	53.7	62.1	1.319	NS
Troubled by near-falls (%)	47.7	65.1	1.530	0.000
Confidence in balance (0–100)	52.5±29.0	35.4±25.3	0.978	0.000

Contoso

Deambulazione paraparetica



	Patients	Controls		
	Mean±SD	Mean±SD	P values	Cohen's d
Time-distance parameters				
Walking Speed [km/h]	2.40±1.20	2.63±0.70	0.283	0.223
Stance duration [% cycle]	68.33±7.16	67.21±2.54	0.622	0.208
Swing duration [% cycle]	31.76±7.19	32.92±3.11	0.657	0.209
1st double support [% cycle]	18.18±6.99	16.85±2.79	0.554	0.250
2nd double support [% cycle]	19.07±9.14	16.91±3.34	0.434	0.314
Cadence [steps/s]	0.71±0.23	0.70±0.12	0.120	0.055
Step length [% limb length]	**0.66±0.14**	**0.72±0.09**	**0.023**	**0.510**
Step width [% limb length]	0.31±0.06	0.28±0.05	0.004	0.543
Kinematic parameters (Rangeof angular motion)				
Hip [°]	35.10±6.78	34.96±4.63	0.905	0.024
Knee [°]	**45.45±11.90**	**56.35±5.95**	**<0.001**	**1.159**
Ankle [°]	**21.36±8.57**	**27.79±6.79**	**<0.001**	**0.832**
Trunk lateral banding [°]	**6.67±2.93**	**3.72±1.70**	**<0.001**	**1.232**
Trunk flexion-extension [°]	**4.39±2.61**	**2.92±0.76**	**0.004**	**0.765**
Trunk rotation [°]	**25.29±17.45**	**13.16±14.42**	**<0.001**	**0.758**
Pelvis obliquity [°]	6.09±2.28	5.16±1.56	0.298	0.476
Pelvis tilt [°]	89.14±31.50	90.29±28.44	0.931	0.038
Pelvis rotation [°]	**16.89±7.86**	**13.77±8.32**	**0.007**	**0.385**
Kinetic parameters				
AI_{1stDS_Hip}	8.24±3.52	10.36±2.54	0.568	0.691
AI_{2ndDS_Hip}	2.93±2.91	2.24±1.71	0.348	0.289
AI_{1st_Knee}	**3.02±4.02**	**2.53±4.08**	**0.016**	**0.121**
AI_{2nd_Knee}	2.14±3.92	1.05±1.91	0.642	0.363
AI_{1stDS_Ankle}	0.91±3.31	0.96±2.09	0.917	0.025
$AI_{MidStance\_Ankle}$	27.55±8.07	28.22±5.19	0.063	0.099
AI_{2ndDS_Ankle}	8.63±5.22	7.03±3.07	0.716	0.374
MS_{Knee}	45.98±17.43	41.64±14.48	0.332	0.271
MS_{Peak1} [N*m/Kg]	1.09±0.34	1.02±0.41	0.324	0.186
MS_{Peak2} [N*m/Kg]	0.92±0.39	0.86±0.29	0.526	0.175
sEMG parameters				
$TMCf_{Ante\_Ankle}$	**21.20±6.39**	**13.20±3.70**	**<0.001**	**1.532**
$TMCf_{Ante\_Knee}$	19.12±7.62	16.62±4.41	0.380	0.402

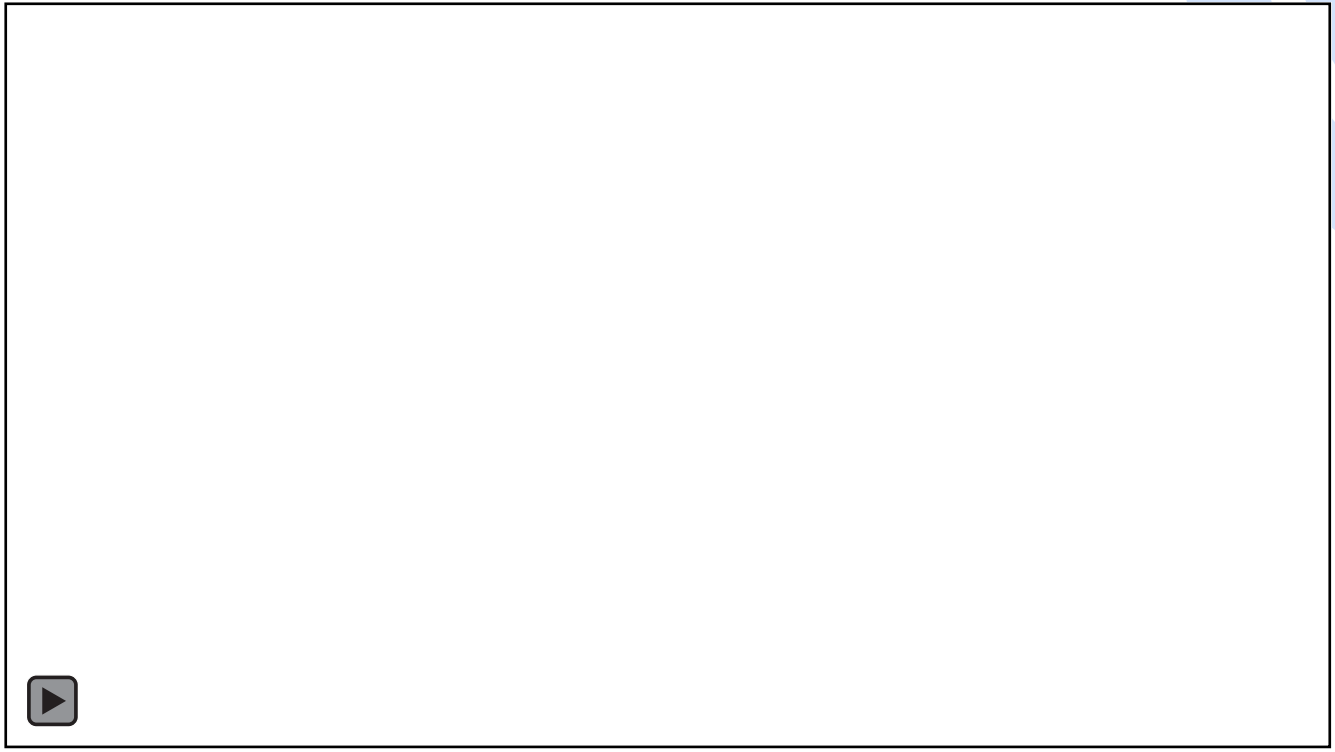
Bold type indicates significant differences between patients and controls. Cohen's d values indicate the effect size for the comparison between the two means ("small" if d = 0.2, "medium" if d = 0.5, "large" if d = 0.8).

RESEARCH ARTICLE

Gait Patterns in Patients with Hereditary Spastic Paraparesis

Mariano Serrao[1,2☯*], Martina Rinaldi[3☯], Alberto Ranavolo[4], Francesco Lacquaniti[5,6,7], Giovanni Martino[5,6], Luca Leonardi[1], Carmela Conte[8], Tiwana Varrecchia[3], Francesco Draicchio[4], Gianluca Coppola[10], Carlo Casali[1], Francesco Pierelli[1,9]

Deambulazione neuropatica



The association between peripheral neuropathy and daily-life gait quality characteristics in people with diabetes

Chantal M. Hulshof [a,b,*], Marike van der Leeden [b,c], Jaap J. van Netten [a,b,*], Maarten Gijssel [d,e], Jordi Evers [f], Sicco A. Bus [a,b], Mirjam Pijnappels [b,g]

	All participants (n=96)	People with peripheral neuropathy (n=66)	People without peripheral neuropathy (n=30)	All participants (n=96)		
	Mean (SD)	Mean (SD)	Mean (SD)	Unstandardised β (95% CI)	p-value	Effect size (R^2)
Walking speed (m/s)	0.83 (SD 0.20)	0.81 (SD 0.19)	0.88 (SD 0.23)	-0.114 (-0.202 to -0.026) [f]	0.012*	0.101
Stride length (m)	1.07 (SD 0.20)	1.06 (SD 0.20)	1.10 (SD 0.20)	0.028 (-0.011 to 0.067) [w,g,i]	0.159	0.039
Stride length variability (m)	0.07 (SD 0.02)	0.07 (SD 0.02)	0.07 (SD 0.02)	-0.008 (-0.016 to 0.000) [w,g,a,d]	0.062	0.272
Stride frequency (strides/s)	0.82 (SD 0.07)	0.81 (SD 0.07)	0.85 (SD 0.07)	-0.030 (-0.057 to -0.003) [w]	0.028*	0.368
Stride regularity VT	0.60 (SD 0.13)	0.59 (SD 0.12)	0.64 (SD 0.13)	-0.009 (-0.045 to 0.028) [w,d]	0.641	0.616
Stride regularity ML	0.52 (SD 0.10)	0.52 (SD 0.11)	0.52 (SD 0.10)	0.029 (-0.018 to 0.077) [w,g,i]	0.224	0.128
Stride regularity AP	0.53 (SD 0.11)	0.53 (SD 0.11)	0.54 (SD 0.10)	0.037 (-0.007 to 0.082) [w,d,g]	0.099	0.299
Gait complexity						
Sample entropy VT	0.27 (SD 0.09)	0.27 (SD 0.06)	0.26 (SD 0.13)	1.023 (0.938 to 1.117) [w,d,b]	0.614	0.240
Sample entropy ML	0.31 (SD 0.09)	0.30 (SD 0.07)	0.32 (SD 0.12)	0.931 (0.839 to 1.030) [w,d,g,a]	0.166	0.063
Sample entropy AP	0.27 (SD 0.09)	0.27 (SD 0.08)	0.28 (SD 0.12)	0.912 (0.828 to 1.005) [w,b,d,g]	0.061	0.352
Gait intensity						
Root mean square VT (m/s^2)	1.46 (SD 0.48)	1.38 (SD 0.43)	1.63 (SD 0.55)	-0.074 (-0.143 to -0.006) [w]	0.034*	0.090
Root mean square ML (m/s^2)	1.23 (SD 0.26)	1.19 (SD 0.25)	1.31 (SD 0.27)	-0.054 (-0.151 to 0.043) [w,g,a]	0.273	0.421
Root mean square AP (m/s^2)	1.10 (SD 0.27)	1.06 (SD 0.26)	1.18 (SD 0.29)	-0.015 (-0.075 to 0.046) [w,g,a]	0.631	0.794
Gait smoothness						
Index of harmonicity VT	0.63 (SD 0.15)	0.62 (SD 0.15)	0.65 (SD 0.15)	0.017 (-0.036 to 0.070) [w,g,d,b]	0.523	0.471
Index of harmonicity ML	0.46 (SD 0.21)	0.50 (SD 0.22)	0.43 (SD 0.19)	0.008 (-0.075 to 0.091) [w,g,a]	0.847	0.362
Index of harmonicity AP	0.70 (SD 0.09)	0.70 (SD 0.09)	0.69 (SD 0.09)	0.001 (-0.036 to 0.039) [w,g,a]	0.937	0.297
Gait symmetry						
Harmonic ratio VT	1.96 (SD 0.51)	1.82 (SD 0.44)	2.27 (SD 0.55)	-0.322 (-0.474 to -0.170) [w]	<0.001***	0.560
Harmonic ratio ML	1.04 (SD 0.30)	1.00 (SD 0.20)	1.91 (SD 0.34)	-0.034 (-0.160 to 0.101) [w,d,g,a]	0.622	0.167
Harmonic ratio AP	1.77 (SD 0.42)	1.72 (SD 0.42)	1.87 (SD 0.40)	-0.017 (-0.163 to 0.130) [w,g,d,a]	0.823	0.495
Gait consistency						
Power at step frequency VT (psd)	0.56 (SD 0.21)	0.53 (SD 0.19)	0.63 (SD 0.23)	-0.016 (-0.074 to 0.042) [w,g,b,d]	0.587	0.677
Power at step frequency ML (psd)	0.39 (SD 0.20)	0.40 (SD 0.21)	0.36 (SD 0.17)	0.012 (-0.069 to 0.093) [w,g,b,d]	0.762	0.305
Power at step frequency AP (psd)	0.54 (SD 0.14)	0.54 (SD 0.14)	0.54 (SD 0.13)	0.009 (-0.055 to 0.074) [w,g,a,d]	0.775	0.083
Gait stability						
Lyapunov estimate	2.08 (SD 0.22)	2.09 (SD 0.22)	2.07 (SD 0.25)	-0.056 (-0.149 to 0.038) [w,d,g]	0.242	0.259
Lyapunov per stride	2.57 (SD 0.33)	2.61 (SD 0.29)	2.48 (SD 0.38)	0.036 (-0.072 to 0.144) [w,d]	0.506	0.474
Gait quality composite score	0.71 (SD 0.77)	0.64 (SD 0.80)	0.87 (SD 0.69)	0.082 (-0.201 to 0.365) [w,d,g,a]	0.566	0.442

Article

Gait Pattern in Charcot-Marie-Tooth Disease Type 1A According to Disease Severity

Jihyun Park [1], So Young Joo [2], Byung-Ok Choi [3], Dae-Hyun Kim [4], Jong Bum Park [5], Jong Weon Lee [6,7] and Deog Young Kim [6,7,*]

	Control Group	CMT1A Group		
		CMT1A Total	Mild Group	Moderate Group
Gait speed (m/s)	1.14 ± 0.10	1.05 ± 0.14 *	1.11 ± 0.11	0.95 ± 0.12 *†
Cadence (steps/min)	110.50 ± 5.84	111.38 ± 9.58	115.23 ± 7.63 *	104.63 ± 9.05 *†
Step length (m)	0.61 ± 0.05	0.56 ± 0.07 *	0.58 ± 0.07 *	0.54 ± 0.07 *
Step time (s)	0.54 ± 0.03	0.54 ± 0.05	0.52 ± 0.04	0.58 ± 0.06 *†


thank you
danke
謝謝
ngiyabonga
teşekkur ederim
спасибо
dank je
gracias
terima kasih
mochchakkeram
dziękuję
go raibh maith agat
sukriya
kop khun krap
obrigado
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