Supplementary Material

Supplementary Tables

Supplementary Table 1: description of PAM micro and macro parameters

Feature	Type	Unit of Measurement	Definition
Mode Gait Velocity Short WB	Micro	m/s	Mode of the weekly distribution of the gait velocity feature from WBs between 10s and 30s of duration
Mode Gait Velocity Medium WB	Micro	m/s	Mode of the weekly distribution of the gait velocity feature from WBs between 30s and 60s of duration
Mode Gait Velocity Long WB	Micro	m/s	Mode of the weekly distribution of the gait velocity feature from WBs above 60s of duration
95th Percentile Gait Velocity All WB	Micro	m/s	95th of the weekly distribution of the gait velocity feature from all WBs
Mode Stride Length Short WB	Micro	m	Mode of the weekly distribution of the stride length feature from WBs between 10s and 30s of duration
Mode Stride Length Medium WB	Micro	m	Mode of the weekly distribution of the stride length feature from WBs between 30s and 60s of duration
Mode Stride Length Long WB	Micro	m	Mode of the weekly distribution of the stride length feature from WBs above 60s of duration
95th Percentile Stride Length All WB	Micro	m	95th of the weekly distribution of the stride length feature from all WBs
Mode Cadence Short WB	Micro	steps/min	Mode of the weekly distribution of the cadence feature from WBs between 10s and 30s of duration
Mode Cadence Medium WB	Micro	steps/min	Mode of the weekly distribution of the cadence feature from WBs between 30s and 60s of duration
Mode Cadence Long WB	Micro	steps/min	Mode of the weekly distribution of the cadence feature from WBs above 60s of duration
Median Number of Short WB / day	Macro	WB/day	Weekly median of daily sum of number of WBs between 10s and 30s of duration
Median Number of Medium WB / day	Macro	WB/day	Weekly median of daily sum of number of WBs between 30s and 60s of duration
Median Number of Long WB / day	Macro	WB/day	Weekly median of daily sum of number of WBs longer than 60s of duration
Max Number of Long WB / day	Macro	WB/day	Weekly maximum of daily sum of number of WBs longer than 60s of duration
Median Duration of Long WB / day	Macro	s/day	Weekly median of daily average duration of WBs longer than 60s of duration
Median Step count/day	Macro	step/day	Weekly median of daily sum of steps using all WB
Median Ratio Active/Sedentary	Macro	-	Weekly median of the ratio between active and sedentary time measured
Median MVPA Time	Macro	min/day	Weekly median of the daily time spent in moderate-to-vigorous activity
Median Hn	Complexity	Hn/day	Weekly median of daily entropy measured in activity patterns

Supplementary table 2: correlation analysis between the 2x10m test and clinical scores

| Parameter	MDS-UPDRS III			PIGD			BBS		
	ρ MSA	ρ PSP	ρ PD	ρ MSA	ρ PSP	ρ PD	ρ MSA	ρ PSP	ρ PD
Mean									
Gait Velocity (m/s)	-0.40	**-0.67***	**-0.48***	**-0.62***	**-0.71***	**-0.50***	**0.81***	**0.47***	0.27
Stride Length (m)	**-0.44***	**-0.61***	**-0.44***	**-0.61***	**-0.65***	**-0.49***	**0.80***	**0.57***	**0.39***
Stride Time (s)	0.05	0.30	0.31	0.27	0.34	**0.31***	-0.35	-0.21	0.00
Stance Percentage	0.18	**0.50***	0.06	0.41	**0.55***	0.19	**-0.69***	-0.33	0.03
Max Sensor Lift (m)	-0.30	-0.20	0.06	-0.28	-0.23	0.19	**0.69***	0.04	0.21
Coefficient of Variation									
Gait Velocity	0.15	**0.54***	**0.41***	0.18	**0.51***	**0.57***	**-0.67***	-0.45	**-0.49***
Stride Length	0.14	0.37	**0.34***	0.17	0.33	**0.52***	**-0.64***	-0.42	**-0.43***
Stride Time	-0.09	**-0.52***	**0.51***	0.09	**0.59***	**0.60***	**-0.51***	-0.37	**-0.56***
Stance Percentage	0.03	0.41	0.28	0.14	**0.62***	**0.38***	**-0.7***	**-0.61***	**-0.35***
Max Sensor Lift	-0.16	0.39	-029	-0.08	**0.57***	-0.12	-0.43	-0.36	0
Asymmetry (%)									
Gait Velocity	0.05	**0.50***	0.12	0.02	**0.47***	0.19	-0.3	-0.24	**-0.31***
Stride Length	0.01	**0.53***	0.08	-0.12	**0.46***	0.13	**-0.44***	-0.28	0.21
Stride Time	0.16	**0.46***	-0.13	**0.43***	**0.57***	0.07	-0.37	-0.27	-0.26
Stance Percentage	0.27	0.04	-0.13	0.38	0.28	0.23	**-0.52***	-0.38	0.1
Max Sensor Lift	-0.32	0.28	**-0.32***	-0.26	0.44	-0.23	-25	-0.34	0.11

ρ values represent Spearman correlation coefficients. Bold numbers with * indicate significant correlations (p<0.05). MDS-UPDRS III: Movement disorder society Unified Parkinson's disease rating scale-part 3; PIGD: Postural instability and gait difficulty; BBS: Berg balance scale.

Supplementary table 3: correlation analysis between the physical activity monitoring and clinical scores

Parameter	MDS-UPDRS III			PIGD			IPAQ Walking		
	ρ MSA	ρ PSP	ρ PD	ρ MSA	ρ PSP	ρ PD	ρ MSA	ρ PSP	ρ PD
Short WBs (10-30 s)									
Gait Velocity	**-0.60***	-0.36	-0.12	-0.4	-0.29	**-0.47***	-0.33	**0.48***	0.13
Stride Length	**-0.62***	-0.08	0.00	**-0.56***	0.01	**-0.34***	-0.16	**0.52***	0.17
Cadence	0.08	-0.18	-0.19	0.12	-0.23	-0.21	**-0.46***	-0.34	0.05
No. of WB/day	-0.27	-0.42	-0.23	-0.06	-0.39	-0.13	**-0.47***	-0.19	0.03
Medium WBs (31-60 s)									
Gait Velocity	**-0.64***	-0.19	-0.18	**-0.53***	-0.02	**-0.43***	-0.28	0.10	0.30
Stride Length	**-0.56***	-0.09	0.01	**-0.52***	-0.09	-0.25	-0.01	0.30	0.26
Cadence	-0.23	-0.07	-0.19	-0.06	0.03	-0.30	-0.39	-0.39	0.15
No. of WB/day	**-0.49***	-0.11	-0.34	-0.26	-0.22	-0.15	-0.36	-0.22	-0.04
Long WBs (> 60 s)									
Gait Velocity	**-0.48***	**-0.63***	-0.21	-0.37	**-0.54***	**-0.42***	-0.25	0.28	**0.35***
Stride Length	**-0.58***	**-0.56***	-0.12	-0.43	**-0.49***	**-0.37***	-0.01	**0.49***	0.23
Cadence	-0.33	-0.43	-0.23	-0.22	-0.38	-0.29	-0.12	-0.01	0.19
No. of WB/day	-0.32	0.01	0.05	-0.23	0.22	0.08	0.41	**0.51***	**0.31***
Max. No. of WB/day	-0.1	-0.14	0.24	0.10	-0.13	0.18	**0.48***	**0.49***	**0.32***
Median duration	-0.41	-0.4	0.18	-0.39	-0.22	0.13	0.32	**0.47***	**0.36***
95th percentile all WBs									
Gait Velocity	**-0.65***	**-0.73***	-0.26	**-0.62***	**-0.50***	**-0.37***	0.28	0.33	0.08
Stride Length	**-0.65***	**-0.68***	-0.22	**-0.71***	-0.44	**-0.36***	0.39	0.38	0.12
Macro and complexity parameters (median)									
Step count / day	-0.40	-0.31	-0.21	-0.22	-0.33	-0.11	0.03	-0.03	0.26
Ratio Active/Sedentary	**-0.56***	-0.39	-0.13	-0.37	-0.42	-0.10	-0.09	-0.01	0.20
MVPA	-0.39	-0.37	-0.24	-0.17	-0.40	-0.15	-0.01	-0.08	0.22
Information Entropy	**-0.58***	**-0.55***	-0.21	-0.36	**-0.52***	-0.20	-0.01	-0.02	0.23

ρ ρ values represent Spearman correlation coefficients. Bold numbers with * indicate significant correlations (p<0.05). MDS-UPDRS III: Movement disorder society Unified Parkinson's disease rating scale-part 3; PIGD: Postural instability and gait difficulty; IPAQ: International Physical Activity Questionnaire.
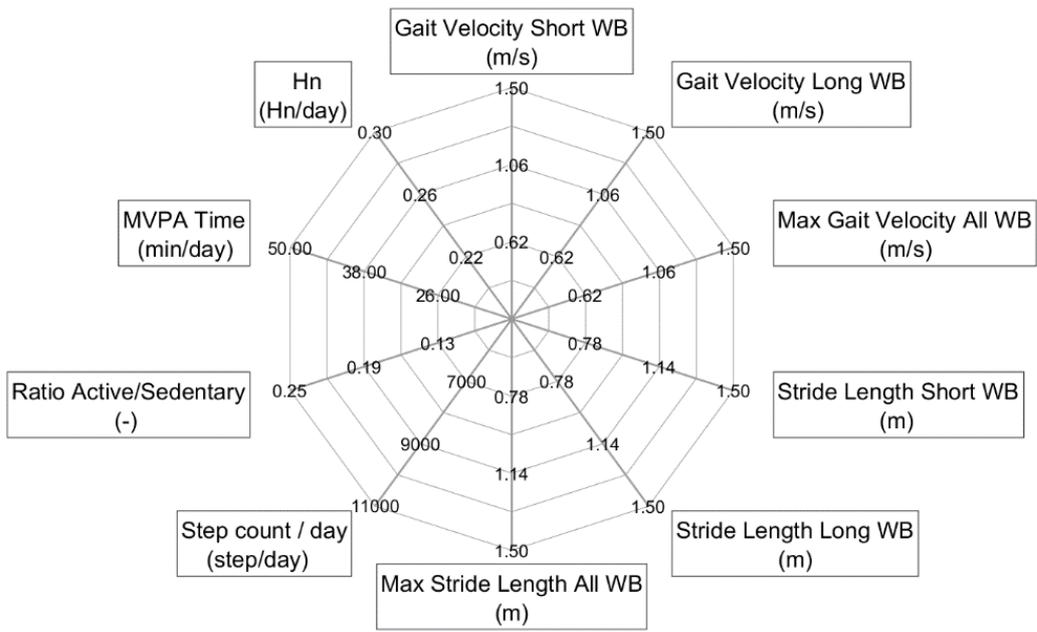
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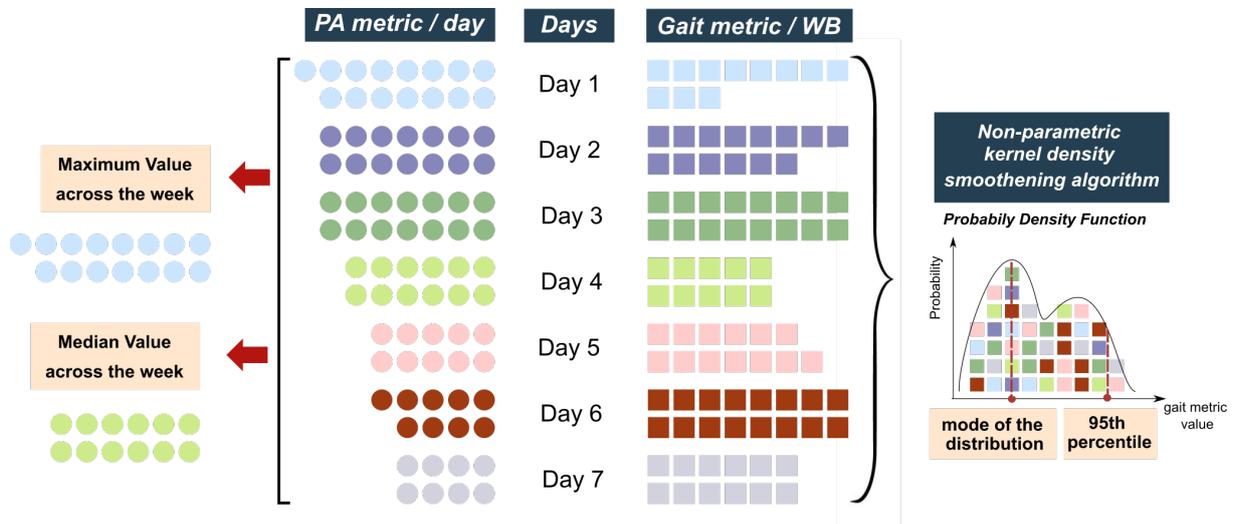
Supplementary Figure 1: aggregation method for PAM micro and macro parameters.
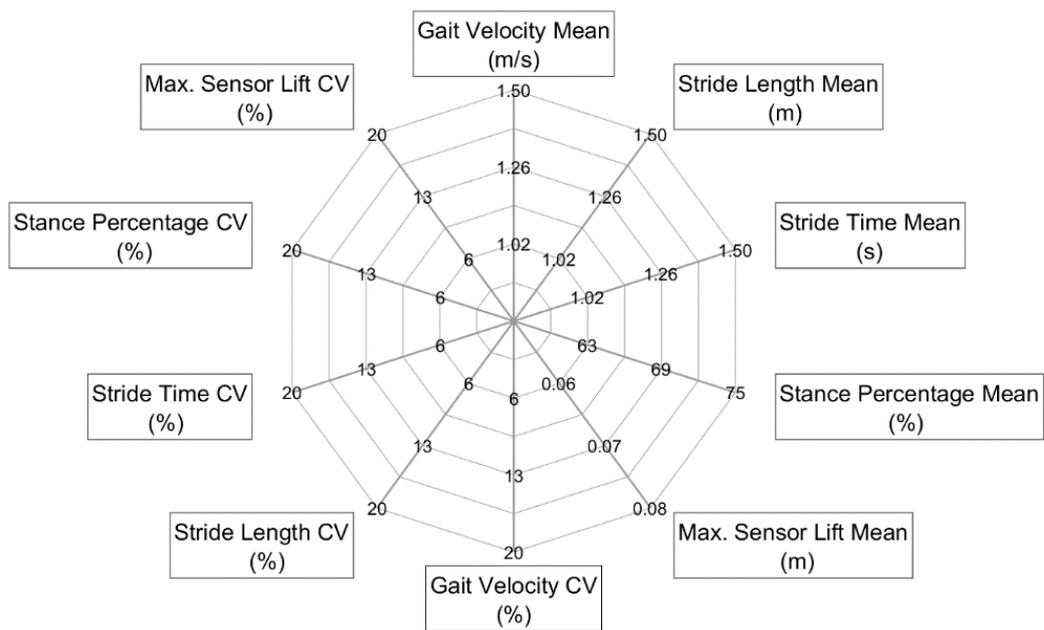
Supplementary Figure 2: Unit of measurement of IGA spider plot (Fig. 1).

Supplementary Figure 3: Unit of measurement of PAM spider plot (Fig. 2).

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