PARKINSON STUDY GROUP

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Capturing Parkinson's disease heterogeneity with quantitative mobility measures

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OBJECTIVE: To evaluate clinic-based, quantitative mobility measures using a wearable sensor in comparison with standard clinic assessment for characterization of Parkinson's disease (PD) heterogeneity, including motor subtypes, cognition, and disability.
BACKGROUND: There is substantial heterogeneity in PD motor and non-motor features. At least two major subtypes have been recognized, tremor dominant (TD) and postural instability gait disorder (PIGD), with potential implications for progression and overall disability. Compared to standard clinical rating scales, instrumented motor testing may offer more sensitive and robust characterization of PD motor and non-motor features.
METHODS: During routine clinic visits, subjects with PD completed a 10-minute motor protocol, including a 32-foot walk, Timed Up and Go (TUG) with turn, and standing posture task, while wearing a sensor device (DynaPort Hybrid, McRoberts BV), and 12 previously-validated mobility measures were computed. Regression analyses evaluated each metric in relation to (i) motor MDS-UPDRS, (ii) motor subtype (TD vs. PIGD), (iii) cognition (Montreal Cognitive Assessment, MoCA), and (iv) disability (Patient-Reported Outcomes Measurement Information System-29). All primary analyses included age, gender, and disease duration as covariates, and we secondarily adjusted for MDS-UPDRS.
RESULTS: In 200 subjects with PD (63% male, age 65±9, 68% H&Y stage 2, MoCA 25±3), 5 out of 12 mobility measures were not associated with motor MDS-UPDRS, revealing independent features of motor performance measured by the device. Measures of gait (speed, cadence, step regularity), transitions in the TUG (stand to sit and sit to stand), and turn (yaw) were significantly associated with PD motor subtype, cognition, and disability (all anti-correlated, $p<0.05$). All associations were robust to adjustment for motor MDS-UPDRS.
CONCLUSION: Quantitative mobility measures correlate with indices of PD motor and non-motor heterogeneity. Moreover, these metrics capture relevant features of motor performance beyond those obtained using the MDS-UPDRS. Clinic-based, wearable sensors show promise for enhanced phenotyping and dissection of PD heterogeneity.