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OBJECTIVES. Gait and balance disorders are related to risk of falling and significantly affects functional activities of daily life in patients with Parkinson's disease (PD). Previous studies have focused on detection of subtle gait and postural alterations from the early stages of the disease. Autonomic dysfunction is highly associated with falls and gait impairment in patients with advanced PD. Recent studies suggest that earlier development of dysautonomia is associated with more rapid disease progression and shorter survival time. We aimed at investigating i) gait and postural parameters in early non-demented PD patients using wearable sensors, and ii) to correlate digital parameters with motor and nonmotor symptoms, including autonomic dysfunction.

MATERIALS. Sixty early PD patients (disease duration <5 years, Hoehn & Yahr ≤2.5) and 21 age and sex-matched healthy controls (HC) were consecutively enrolled.

METHODS. Gait and balance parameters were acquired using six Opal V2R wearable sensors, when performing the Timed up and go, 7 and 10 Meters walking tests in both single and dual task (ST/DT) conditions. Motor and nonmotor symptoms were evaluated using the Unified Parkinson's disease Rating scale part III (UPDRS-III), the Nonmotor Symptoms scale (NMSS) and the Scales for Outcomes in Parkinson's Disease - Autonomic Dysfunction (SCOPA-AUT). Bivariate correlation analysis between clinical and wearable sensors data were performed.

RESULTS. Higher SCOPA-AUT scores significantly correlated with worse gait and postural performances as detected by wearable sensors in both ST and DT conditions (Figure 1). Interestingly, no correlations have been found between SCOPA-AUT and UPDRS III, including axial and gait subscores (data not shown).

DISCUSSION. Motor assessment by means of wearable sensors may help to detect subclinical gait and balance alterations. These subtle changes are already associated with autonomic dysfunctions, suggesting a potential role to predict worse clinical outcome.

CONCLUSION. Our findings revealed that application of wearable sensors could provide useful information for the characterization of early PD patients, when clinical evidence of gait and postural disturbances may not be detectable and may be proposed as a potential surrogate biomarker for disease progression.

Figure 1. Significant correlation analysis between clinical features and wearable sensors metrics. Abbreviations: DT, dual task; L, Left; R, Right; ST, single task; TUG, Timed up and go; SCOPA-AUT, Scales for Outcomes in Parkinson's Disease - Autonomic Dysfunction

