

Arm swing reduction in Parkinson disease: a study with a network of wearable sensors

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Introduction: Parkinson's disease (PD) commonly manifests with arm swing reduction during gait [1]. Previous kinematic studies using traditional gait analysis have shown decreased arm swing range, amplitude, and velocity in PD compared with controls. The pathophysiology of arm swing abnormalities in PD is still under debate since it would reflect bradykinesia or articular limitation due to rigidity [2-3]. We have recently reported more advanced measurements of reduced arm swing in PD, by using a wearable sensors network in an ecological experimental setting.

Objective: The first aim is to describe new objective arm-swing features extracted by a frequency-based analysis in patients performing the timed-up and go (TUG) test. A second aim is to correlate the extracted instrumental measures with specific UPDRS subitems for bradykinesia, rigidity, and tremor.

Methods: We recruited 44 PD patients in the early stage of the disease (H&Y<2) and never exposed to L-Dopa (drug-naïve) and 31 age-matched healthy controls. We performed a sensor-based analysis of arm swing during gait. The collected data were FFT transformed, and the frequency content was further analysed. The Spearman's test was used to correlate specific harmonic features with upper limb clinical scores.

Results: The kinematic analysis demonstrated that arm-swing reduction in PD can be objectively described in terms of decreased amplitude of all harmonics extracted from kinematic analysis of upper limb movements. Specific kinematic features highly correlated with rigidity and, in a lesser extent, with bradykinesia; there was no significant correlation with upper limb tremor.

Conclusions: The kinematic analysis based on our wearable sensors network demonstrated arm-swing reduction objectively during gait in PD patients performing a TUG test in an ecological setting. Our findings also suggest that reduced arm swing in PD would more likely reflect the severity of rigidity rather than bradykinesia.

Bibliography:

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