

An algorithm for the detection of motor symptoms and complications in patients with Parkinson's disease

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Introduction: Wearable devices have the potential to provide an objective recording of PD motor symptoms. Some of the proposed solutions are based on detection of the frequency content in the range in which pathological movements due to PD typically occur. However, this frequency range is superimposed to power spectrum of physiological movements. Therefore, solely evaluating the frequency content does not usually offer a sensible distinction between movement disorders and normal daily activity. In order to improve this, the wrist-worn tool "PD-Watch" has been proposed that evaluates the frequency data content and identifies specific movement patterns that movement disorders are typically associated with (e.g. hand tremors at rest due to PD usually occur with a supination-pronation characteristic).

Objectives: We propose to assess the extent of the contribution due to specific movement patterns identification in reducing the probability of mistaking the discrimination between movement disorders and normal daily activity.

Methods: 20 patients with PD were recruited. Data were acquired with the PD-Watch for 24 hours. Data were processed with solely frequency evaluation (Method#1) and with the evaluation of both frequency and movement patterns (Method# 2, i.e. PD-Watch algorithm). Data provided by the two methods were compared to patient diaries and to proper items of the UPDRS.

Results: Data provided by the Method#2 show a good agreement ($r_2 = 0.744$, p-value: 0.0004) [1] with UPDRS scores and patient diaries. Data provided by the Method#1 overrate the presence of motor symptoms, e.g. the overall tremor duration detected during the whole day may be overestimated from 10% to around 100% with respect to UPDRS scores and patient diaries.

Conclusions: While results need to be extended with further clinical trials, the proposed algorithm on the detection of both frequency and movement pattern appears promising and suitable for supporting the evaluation of motor symptoms and complications.

References:

[1] L. Battista and A. Romaniello, *A wearable tool for selective and continuous monitoring of tremor and dyskinesia in Parkinsonian patients*, Parkinsonism & Related Disorders, Vol. 77, pp. 43-47 (2020).