

Gait analysis between a cohort of Alzheimer's disease, Lewy Body Dementia, Parkinson disease and healthy control group a cross sectional study with wearable devices

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Background: The application of wearable motion sensors is currently in continuous expansion in the field of motion disorders. Numerous studies demonstrate the usefulness and need for an objective assessment, using tools capable of quantifying the movement, walking and balance of patients, which have so far been assessed using the indirect measurement of international assessment scales.

To date there is still no application of these devices in the panorama of degenerative disorders, considering movement disorders, gait alteration as a possible marker, in this case, a digital marker to evaluate the patient suffering from cognitive impairment.

Objective: To investigate the performance differences of standard motion tasks detected with wearable motion sensors between healthy subjects and patients with Alzheimer's disease and Lewy body dementia.

Comparison of sensory measurements in the two groups of patients affected by cognitive impairment (AD or DLB) in tests characterized by dual tasking tasks (motor and cognitive).

Methods: A cohort of 140 subjects, divided into 19 patients diagnosed with AD, 20 DLB, 21 patients diagnosed with PD and 80 Healthy Controls were selected among the patients belonging to the outpatient clinic designated for patients with movement disorders or for patients with neurocognitive decline at the Neurological Clinic of the U.O. Neurology II of the Civil Hospitals of Brescia and tested in an ambulatory settings with Reha Gait (Magdeburg, DE) wearable sensor.

Results: From the comparison analysis of the data collected using wearable motion sensors we find out significant differences emerged between the various measurements: several significant differences were found between the cohort of healthy subjects and patients with cognitive impairment, both in patients with dementia with Lewy bodies and in patients with Alzheimer's disease. The comparison between the group of AD and DLB patients did not reveal significant differences between the motor and cognitive dual tasks considering the average values of the various gait parameters recorded by the wearable sensors, but analyzing the COST compared to the Straight Walking fast significant differences emerged in the cognitive task, particularly in the Number of Steps ($p = 0.017$), Step Time and derived measures ($p < 0.05$).

Conclusions: Wearable movement sensors are able to demonstrate a statistically significant difference in gait between healthy subjects of the same age, sex, education and patients affected by either AD, DLB and PD. Furthermore, from the analysis of the data it emerges that subjects affected by AD also show significant differences compared to healthy controls in terms of gait alterations. These alterations are comparable to those presented by patients with DLB, with respect to which statistically significant differences in the cognitive Dual task (Serial Subtraction) can be appreciated.