ENERGY COST OF LOCOMOTION AND WALKING ABILITY AT MAXIMAL AND SELF-SELECTED SPEED IN PATIENTS WITH PARKINSON’S DISEASE

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Parkinson’s disease (PD) is characterized by a progressive decline in motor function and walking capacity, which are cardinal functions for daily life activities. Walking impairment, characterized by velocity reduction, stride length shortening, increased cadence, and associated with an increment in resting energy expenditure, is well documented in PD patients. Aim of the study was to assess walking adaptations and related energetic cost of locomotion during daily life activities.

A total of 28 volunteers were enrolled: 14 (9 males) PD patients (Hoehn & Yahr stage I-III), age (M±SD) 67.9±8.1 yrs, BMI 26.5±2.8 kg/m², and 14 (6 males) healthy control (C) subjects, age 66.6±5.3 yrs, BMI 25.7±2.4 kg/m².

Functional walking patterns were assessed by step counting with a pedometer (Oregon scientific PET316 FM) during a 4 min walk at 2 different speeds: self-selected speed (SS) and maximal speed (MS). Cardio-respiratory parameters were assessed by heart rate (HR) recording with an HR monitor (Polar S810, Finland) and breath by breath expiration gas analysis with a mobile metabolic system (Cosmed K4b², Italy) in 5 different conditions: 1) at rest, 2) during 5 min sitting, 3) during 5 min standing, 4) during 4 min walk at SS, and 5) during 4 min walk at MS. The net energetic cost of locomotion was calculated as (VO₂walk-VO₂rest)/velocity.

Walking speed was significantly reduced in PD patients compared to C subjects in both walking conditions, (0.8±0.1 vs 1.0±0.2, and 1.1±0.2 vs 1.4±0.2 m/s at SS and MS, respectively; p<0.05), as well as stride length (0.98±0.20 vs 1.12±0.16, and 1.22±0.17 vs 1.35±0.18 m/s at SS and MS, respectively; p<0.05), whereas cadence was significantly reduced at MS only (108±16 vs 125±10 steps/min; p<0.05). All cardio-respiratory parameters were comparable between PD and C groups at rest and during walking at SS, despite the significantly reduced walking velocity in the PD group. On the contrary, VO₂ was significantly reduced in PD compared to C subjects during walk at MS (12.8±3.2 vs 16.8±2.9 mlkg⁻¹min⁻¹; p<0.05). The net energetic cost of locomotion tended to be higher in PD than in C subjects at SS (9.3 vs 7.9 mlO₂/m), whereas was comparable between groups at MS (10.3 vs 10.7 mlO₂/m).

Consequently, the increase in energetic cost from SS to MS was significantly lower in PD than in C subjects (1.0±1.5 vs 2.8±1.8 mlO₂/m; p=0.01).

Our data confirm the walking impairment in PD subjects, irrespective of walking speed. However, the energetic cost of locomotion in PD patients approaches maximal values already at lower speeds, thus representing a possible limit-

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