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Background. Parkinson's disease (PD) is a progressive neurodegenerative disease that includes several motor symptoms. Rigidity, tremor, bradykinesia, and postural instability are the most common (Chou et al., 2023), and abnormal walking patterns were frequently observed in people suffering from PD. Gait in PD is no longer automatic. Moreover, performing a cognitive task during walking decreases the quality of motor performance.

Objective. To analyze kinetic and kinematic parameters in single and dual-task walking in people with Parkinson's disease compared to a healthy control group (HC).

Methods. Inclusion criteria for both groups (PD and HC) were: 30-75 years old, ability to walk with no aids, absence of other pathologies or post-surgical condition that could affect walking, and no cognitive impairment (Mini-Mental State Examination – MMSE <24). Only idiopathic PD were enrolled. A 3D Motion Capture system with ten cameras (47 retroreflective markers and 5 clusters) and 2 force plates recorded kinetic and kinematic data. Subjects were instructed to walk on a 10-meter linear path at a comfortable speed under two conditions: spontaneous walking (single task - 1) and counting backward (dual task - 2) randomly. We collected a minimum of 15 to 25 trials for each task condition. Intra-group (single vs. dual task) and inter-group (same task condition) comparisons were performed regarding spatio-temporal parameters, range of motion (ROM) of the lower limb's joints, and Ground Reaction Forces (GRFs). Statistical analysis was performed using an unpaired t-test or Statistical Parametric Mapping (SPM), depending on the variable tested.

Results. PD (n=12) compared to HC (n=6) showed a statistically significant reduction in cadence (step/min), step and stride length (m), and swing time (s) and an increase in step and stance time (s), double limb support (s) and stride width (m), across all trials. During dual-task conditions compared to single tasks, PD had less knee flexion from toe-off to initial swing and less plantar flexion close to toe-off. PD showed increased dorsiflexion during the push-off phase with statistical significance compared to HC during dual-task conditions. Considering GRFs, the PD group showed a statistically significant decrease both in braking and propulsive forces during both conditions compared to HC. Furthermore, this reduction was also observed between single and dual-task conditions only for the PD group.

Conclusion. Parkinson's disease significantly affects the kinetics and kinematics of walking. Several differences were observed compared to healthy subjects in single and dual-task conditions. The dual-task seems to modify motor performance only in the PD group.