Spatiotemporal and kinematic gait analysis in patients with Frontotemporal dementia and Alzheimer’s disease through 3D motion capture

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Objective
The aim of the present study was to evaluate the spatiotemporal and kinematic gait parameters and investigate the influence of a dual task paradigm in subjects at the early stage of the behavioral variant of Frontotemporal dementia (bvFTD) and Alzheimer’s disease (AD).

Material methods
Patients with clinical, neuropsychological and instrumental diagnosis of bvFTD (n=16) and AD (n=14) were enrolled. Moreover, 16 healthy subjects were recruited as a control group. All patients underwent a clinical examination including UPDRS III and an extensive neuropsychological battery exploring memory, executive and visuospatial domains. Using a Motion Analysis system, we compared spatiotemporal and kinematic parameters in bvFTD, AD and control groups in three different experimental conditions: (1) normal walking; (2) motor dual-task (walking while carrying a tray with 2 glasses filled with water); and (3) cognitive dual task (walking while serially subtracting 7s starting from 100). Mean value and coefficients of variation (CoV) of the following spatiotemporal variables were calculated: speed, stride width, stride length, cycle time, double limb support time (DLS), cadence, stance time, swing time, double/single limb support time (DLS/SLS). Moreover, we analyzed the range of motion on the sagittal plane of the thigh, knee, and ankle joints, normalized for the 100% of the gait cycle calculating the Δs value as the difference between two consecutive peaks in the gait cycle.

Results
All groups didn’t show any difference in spatiotemporal and kinematic parameters when compared the three different tasks. Both bvFTD and AD group showed significant differences in kinematic parameters with respect to control group, while the spatiotemporal parameters were different only in the bvFTD (and not in AD) group as compared to controls. Comparing the spatiotemporal parameters in bvFTD and AD no difference was observed, while motor dual-task affected the kinematic parameters.

Discussion
The dual-tasks were not able to detect gait differences in our experimental groups.

Both bvFTD and AD patients were compromised with respect to the control group. The impairment of spatiotemporal parameters between the bvFTD and control group confirms the crucial role of executive functions, typically compromised in these patients, with respect to AD. The motor pattern in dementia groups seemed to be similar among them.

Conclusion
Our study shows a global worsening of gait function in bvFTD and AD and the crucial role of executive functions on gait, that consequently should not be regarded as an automatic activity.

Bibliography


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