INTRODUCTION

Parkinson’s disease (PD) is associated with several changes in motor tasks including postural control and gait. As such, patients with PD are more likely to experience a fall than their aged-matched peers. In fact, 80 percent of patients with PD fall during the course of their disease with 30 percent falling weekly. Recent research suggests gait variability may be an important predictor of both mobility impairment and falls, which is particularly relevant to PD as instability is a key characteristic of the disease. Among the various spatiotemporal parameters used to evaluate gait variability, step length has been shown to be among the most reliable [1].

Gait initiation is a vital component to mobility as it challenges the postural system by transitioning the body from a stable base of support during standing to the dynamic act of locomotion. In healthy older adults, GI step length variability is demonstrated as an important predictor of postural problems. Due to degradation of the postural control system demonstrated in PD, falls may be provoked during gait initiation and variability in the length of the first step (rather than step-to-step variability) may be important in predicting these falls.

Recent research suggests that first-step length variability in elderly fallers is more than twice as great as first-step length variability seen in elderly non-fallers, while elderly non-fallers did not differ from young non-fallers[2]. Thus, consistency of foot placement during stepping while initiating gait appears to be significant in the prevention of falls and in fall recovery. For steady-state walking, patients demonstrating a coefficient of variation greater than 7 percent have been defined to be at high risk of falling[3].

To date, however, research has yet to examine variability during gait initiation (GI) in PD. Therefore, this study sought to preliminarily investigate GI variability in patients with PD when compared to their aged-matched peers.

METHODS

Seventy-five participants, 57 persons with Parkinson’s disease (65.65±9.63yr, 171.46±8.82cm, 83.48±16.25kg, 2.3±.5 Hoehn and Yahr stage) and 18 age-matched healthy older adults (65.11±12.41yrs, 168.08±10.79cm, 75.23±19.96kg) participated. Persons with PD were tested while clinically “ON” approximately 1 hour after taking their antiparkinsonian medication. At the time of testing, no patients exhibited dyskinesias or other non purposeful movements.

Gait initiation trials began with the participant standing quietly on a force platform (Bertec, Columbus Ohio) mounted flush with the laboratory floor. Initial positioning of the feet was self-selected. In response to an auditory signal, the participants initiated walking and continued to walk for several steps. For each participant, at least 3 data collection trials were collected at a self-selected pace.

Kinematic data were collected using an 3D Optical Capture system (Vicon Peak, Oxford, UK) collecting at 120Hz. Thirty-nine passive reflective markers were attached to the body in accordance with the Vicon Plug-in-Gait marker system. The length of the first step for each trial was calculated as the displacement of the heel marker from initial heel-off to the subsequent heel-strike. Step length variability was then evaluated using the coefficient of variation while analyzing across trials.
RESULTS AND DISCUSSION

Patients with PD showed increased first-step length variability when compared to healthy elderly adults. Increased step variability during GI may have important implications as a predictor of falling and/or freezing in PD and may provide insight into the general impaired mobility and motor control frequently seen in PD. When combined with the results of previous research which have shown alterations in the GI motor program in patients with PD, more research is needed to investigate the effects of GI variability on postural instability and falling in Parkinson’s disease.

REFERENCES


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