

Effects Of Cognitive-Linguistic Load and Dopaminergic Medication Cycle on Gait, Balance, and Risk for Injurious Falls in Parkinson's Disease

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Objective: To determine (1) effects of cognitive-linguistic loading on stability of selected spatial-temporal gait parameters during peak and off dopaminergic medication cycles, (2) changes in an established measure of predicted fall risk (Functional Ambulation Profile [FAP]) relative to medication cycle, and (3) interaction effects of medication cycle and cognitive loading on fall risk

Background: Injurious falls are a pervasive burden on individuals, health care delivery systems, and the global health care economy. Among those with central nervous system compromise, especially in Parkinsonism and other movement disorders, nearly 70% report injurious falls that necessitated emergency department visits during the last six months (Wood, et al, 2002). Previous research from our center has begun to define the relationships between cognitive loading and changes in gait that signal an increased risk for falls (LaPointe, et al, 2006; LaPointe, et al, 2009). The influence and cycle of dopaminergic agents on fall risk and specific temporal-spatial parameters of gait have not been clearly determined however.

Methods: We tested 27 participants with idiopathic Parkinson disease (UDPR Mean =26; Hoehn-Yahr 2, 3, 4) during peak and off peak medication cycles across four counterbalanced conditions of cognitive-linguistic loading (1, [gait only]; 2 low [simultaneous walking and counting by ones]; 3, medium [walking and subtracting by 3s]; 4, high [walking and alphanumeric sequencing]). Temporal-spatial step-by-step gait parameters were measured, recorded, and analyzed using the GAITRite® walkway system. FAP was determined across all conditions and cycles as were measures of velocity, stride length, ambulation time, and double support time.

Results: Significant differences were found when the cognitive load walking conditions including the FAP were compared to the control condition ($p < .05$). Surprisingly, few differences in parameters of gait were found across conditions during peak and off peak medication cycles.

Conclusions: In our study, significant changes in temporal-spatial parameters of gait, including the FAP measure of fall risk were found across medium and high cognitive load conditions. Measured gait parameters did not appear to be influenced by dopaminergic agents or medication cycle however. These findings have important pharmacologic and clinical implications related to fall risk, cognitive resource allocation, and fall prevention.