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The problem of thinking while walking in PD: should coordination deficits really be linked to symptom laterality and rhythmic asymmetries?

Quincy J Almeida

The use of a cognitively demanding dual task while evaluating simultaneous movement performance has become an increasingly popular research tool. Clinically, dual tasking can provide an important glimpse into mechanisms that may underlie and even exacerbate movement impairments in Parkinson's disease (PD) and other movement disorder populations.

One particularly interesting area addressed by dual tasking research is the potential influence of attention demand on aspects of gait and dynamic balance. Plotnik and colleagues¹ attempt to determine whether temporal characteristics of gait are impacted by cognitive demand (see page 347). Much of their research suggests that coordination deficits observed during gait in PD may be identified by evaluating gait rhythmicity asymmetries. Most recently, they have employed a timing based gait cycle measure (PCI) to explore differences between patients with PD and healthy control participants. The authors demonstrate that the coordination differences between PD and healthy control participants are particularly robust when a dual task is performed simultaneously during gait, leading to the conclusion that some aspects of gait may be influenced by higher level cognitive function.

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The authors go on to suggest that PCI is distinct from the level of motor symptom asymmetry and also rhythmic gait asymmetry, since correlations between these variables and PCI were low. The assumption that there may be different mechanisms underlying these uncorrelated variables, however, may be a little premature. While our own work appears to support a rhythmicity deficit that can contribute to impaired upper limb bilateral coordination² and also lower limb timing based gait tasks,³ it is important to question whether PCI might be more representative of a spatial deficit of the lower limbs rather than a temporal issue (in spite of the measure being time based). In our upper limb research, relative phase between the limbs generally refers to position/location of one limb relative to the other. As such, when both upper limbs arrive simultaneously at the midline of the body, we define this as inphase (0° of relative phase) as both limbs arrive at the same relative position. Perhaps defining the expected timing of a step for one lower limb relative to a complete stride (gait) cycle of the other lower limb becomes more of a spatial representation limb position. If this is the case, then it might not be so surprising that rhythmic gait asymmetry does not correlate well with PCI. In fact, one might expect PCI to be more highly correlated with step length. Future research might also consider the relationship between PCI and amplitude deficits given that decreased stride length is a trademark of the typical shuffling gait in PD.⁴

Additionally, it is also important to consider whether the Unified Parkinson's Disease Rating Scale (UPDRS) asymmetry calculation employed would give a true representation of the natural laterality expected with PD motor symptoms. Most clinicians would agree that the side with the most severe tremor is not always the side that would be expected to reveal the most rigidity and/or show the most deficits during tapping, pronation/supination, etc. Laterality of symptoms (side most affected) can also be different in upper limbs than it is for lower limbs. As such, summing across items 20-26 of the UPDRS may not lead to any clear distinction about the laterality of a patient's symptoms, and hence a low correlation with PCI might also be expected.

Given the recently intriguing work on the relationship between freezing of gait and PCI,⁵ it may be worthwhile to evaluate PCI in specific circumstances, such as turns or crowded spaces where freezing of gait is most likely to occur. The relationship between PCI and dyskinesia would also be interesting. Hence, the problem of thinking while walking in PD will continue to be a growing area of research.

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