

Invited Commentary

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Wulf and colleagues¹ are to be congratulated for adding new data to the emerging body of knowledge showing that the instructions given by physical therapists are a powerful determinant of motor performance in people with Parkinson disease (PD). Despite the finding that more than 4 million people worldwide have PD, the evidence for physical therapy interventions is still comparatively sparse. Most trials have described the signs, symptoms, and short-term progression of the disease rather than investigating how individuals respond to different physical therapy interventions. Because people with PD vary considerably with respect to their rate of progression, impairments, activity limitations, participation restrictions, and quality of life, there can be no single recipe for physical therapy treatment.² Rather, each person needs to be assessed individually so that the physical therapist can provide a tailored program, suited to the needs of the individual and those of close family members. The “external focus of attention” advocated in Wulf and colleagues’ article is likely to be beneficial for some people with PD, and methods that require a person to focus his or her attention “internally” on movements or postural alignment might be useful for others.³

Throughout the 10- to 45-year time course of progression, physical therapy goals and strategies need to be adapted to ensure that the person receives interventions that are suitable at the time.² The needs of a newly diagnosed person who is at stage I on the Hoehn and Yahr scale⁴ and has mild slowing and under-scaling of movements are very different from those of the person at stage IV who has long-standing disease and is experiencing loss of balance, falls,

hypokinesia, and possibly other movement disorders such as rigidity, tremor, dyskinesia, and dystonia. The “external focus of attention” strategy tested in the study by Wulf and colleagues is likely to be most suitable for people in the early to mid stages of PD, when cognition and the capacity for motor skill learning are not compromised.

Wulf et al claim that they have shown that, in people at Hoehn and Yahr stage II or III, focusing attention on external cues from a moving support surface disk reduces postural sway. This finding supports existing evidence that people with PD can improve performance when they consciously attend to key aspects of a motor task or action sequence. For example, it is well known that step length improves when a person with PD focuses his or her attention on stepping over visual cues on the floor or thinks about walking with large steps.⁵ The seminal study by Behrman et al⁶ showed that the instruction set delivered to people with PD has powerful effects on performance. How the instructions are phrased before a task is performed has considerable impact on the quality and outcomes of a motor task. Likewise, the scholarly work by Canning et al³ demonstrated that when people with PD were instructed to divide their attention between competing tasks, the performance of the task not receiving attention deteriorated, whereas the primary task was performed relatively well.

Several aspects of Wulf and colleagues’ investigation are controversial and warrant debate. The first is the choice of dependent variables selected for this trial. In upright standing, many people with PD have re-

duced postural sway due to hypokinesia (under-scaling of movement speed and size). Unlike people who have experienced a stroke, traumatic brain injury, or multiple sclerosis and have increased postural sway in standing, there is under-scaling, over-constraint, and reduced variability in postural responses in people with PD. This over-constraint and reduced variability is argued to be a major contributing factor that predisposes people with PD to falls. Posture and movements are stereotyped and lack the usual flexibility and adaptability that enable a person to quickly adjust his or her posture and movement to changing task demands. Therefore, the aim of physical therapy in people with PD often is to increase the variability of performance to enable more adaptability, rather to constrain postural responses even further, as appears to be the aim of Wulf and colleagues in this article.

A second concern is the type of motor task selected for analysis. The basal ganglia regulate the performance of well-learned, sequential motor skills, such as walking, turning, writing, speaking, swallowing, dressing, and turning over in bed. The performance of simple movements (such as steady standing) or novel tasks (such as standing on an inflatable disk, as in Wulf and colleagues’ study) is not compromised to the same extent as goal-directed activities. From the outset, it would be predicted that little difference in postural sway would be detected between focusing on the disk or the feet. Therefore, it is not surprising that “there was no difference between the internal focus and control conditions.” This finding probably was due to the novel nature of the

task, in addition to the small sample size.

Although the findings of this study represent an important step forward, caution needs to be exercised when considering the generalizability of the findings to the population of people with PD as a whole. This is because only a small sample of 14 people with PD was tested and there were no individuals who were mildly affected (Hoehn and Yahr stage I) or, due to the nature of the task, individuals who were severely affected (Hoehn and Yahr stage V).

To conclude, this trial on a novel laboratory-based task provides some

insights into the nature of motor control deficits in people with PD. The physical therapy profession now awaits the results of large-scale controlled clinical trials that quantify the effects of therapeutic strategies routinely used by physical therapists, such as fall prevention, movement strategy training, and progressive resistance strength training.

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Author Response

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We thank Morris for her thoughtful commentary¹ on our study.² We concur with her in the observation that our study provides further support for the role that instructional sets or pretask instructions can play in enhancing the motor performance of individuals with Parkinson disease (PD).^{3,4} Given the constellation of cognitive and movement symptoms common in people with PD, as well as the relationship of cognitive processes to movement control,⁵ it is important to recognize that many individuals with PD retain their capabilities to distinguish between differing instructions and to act upon those distinctions motorically (eg, to increase stride length upon request). Our study provides additional evidence that individuals with mild to moderate disease severity (in the present study, at Hoehn and Yahr levels II and III; in the study by Behrman et al,³ Hoehn and Yahr levels II and III and a few with level IV staging) can distinguish between specific instructions and produce move-

ment nuanced to these instructional distinctions. Furthermore, evidence of instructional set effectiveness is consistent with a recent review that noted stronger support for gait-related physical therapy interventions that combined conventional physical therapy with the provision of external visual or auditory cueing than for conventional physical therapy alone in individuals with PD.⁶ It seems reasonable to suggest that future refinements in physical therapy interventions for people with PD may be enhanced by recognition of the potential of particular forms of instructions to promote more optimal control of movement.

A relatively large and remarkably consistent body of research is accumulating to suggest that instructions to individuals to adopt an external focus of attention are more beneficial than are instructions inducing an internal focus. In our within-subject design, we found again that instructions to focus attention (concentration)

on the intended movement effect ("focus on minimizing movements of the inflatable disk") produced greater reduction in postural sway than instructions inducing an internal or body-related focus ("focus on minimizing the movement of your feet") or the control condition with no explicit focus instruction. The finding that control conditions (if they are included) produce very similar performances as internal focus conditions has been consistent across studies. This finding may suggest that participants "naturally" tend to adopt an internal focus, and, more importantly, it indicates that an external focus results in *enhanced* performance or learning. Interestingly, clinicians have reported that individuals with PD may be aware of their need for external cueing; one individual with PD was observed to remove her belt and place it in a straight line on the floor ahead of her to assist in gait initiation (Carolee J Winstein, PT, PhD, FAPTA; personal communication; December 5, 2008).