

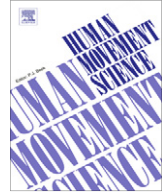


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Prioritizing gait in dual-task conditions in people with Parkinson's

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ABSTRACT

This controlled study examined the effects of a gait prioritization strategy on walking in people with Parkinson's disease (PD). Participants in the training group ($n = 6$) received 30-min therapy to prioritize their attention to take big steps while performing serial three subtractions. Participants in the control group ($n = 6$) received no therapy. Stride length, gait velocity, and accurate enumeration rate were measured at baseline, immediately after training and 30 min after training under both single-task (walk only or subtract only) and dual-task (walk and subtract) conditions. Performance was also assessed during therapy for the training group. Stride length and gait velocity increased immediately when participants followed instructions to prioritize their attention to take big steps ($p = .005$, $p = .04$). Further, the gait variables increased for both single and dual-task conditions for at least 30 min after training when compared to the controls; with a simultaneous reduction in the magnitude of dual-task interference ($p = .03$, $p = .03$). No difference in the accurate enumeration rate was found at any of the assessment time points. Therefore, prioritizing attention to take big steps can be an effective strategy to increase the stride length and walking speed in some people with PD.

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1. Introduction

People with Parkinson's disease (PD) often direct their attention to walking, particularly in taking bigger strides, to counteract their usual slow and short footsteps (Jones et al., 2008). This strategy is

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convenient, requires no external equipment, and can deliver prompt and desirable effects (Behrman, Teitelbaum, & Cauraugh, 1998; Canning, 2005; Lehman, Toole, Lofald, & Hirsch, 2005; Morris, Iansek, Matyas, & Summers, 1996). It is endorsed by many experts and in clinical guidelines (European RES-CUE Consortium, 2004; Keus et al., 2004; Morris et al., 1997). However, some clinicians recommend that dual-task walking should be avoided when using such attentional strategies (Keus et al., 2004; Morris et al., 1997; Rochester et al., 2005), because performing a second task takes attention from walking and affects gait further for people with PD. This is also called dual-task interference (O'Shea, Morris, & Iansek, 2002).

The recommendation is questionable, as two recent publications have reported a positive association between using a gait prioritization strategy (focusing one's attention to walking with big steps when undertaking dual tasks) and the amelioration of gait deficits (Baker, Rochester, & Nieuwboer, 2007; Canning, 2005). In the studies conducted by Canning (2005) and Baker et al. (2007), people with PD walked faster and with longer steps as soon as they followed the instructions to prioritize attention to taking big steps when carrying a tray with glasses, compared to baseline when no specific instructions were given. The mean value of the improved stride length and gait velocity was not significantly different from that of those obtained under a single-task condition (walking only) at baseline (Canning, 2005), nor that obtained from the matched healthy controls under a dual-task condition at baseline (Baker et al., 2007). No significant adverse effect was noted on the performance of the secondary motor task. In reality, it is of prime importance to be able to handle the demand of single task, dual tasks, and multiple tasks during walking in functional environments (World Health Organization, 2001) and therefore the feasible options for people with PD to attain these functional abilities should be further explored.

The gait prioritization studies used non-controlled designs, and their findings could be confounded by non-experimental variables such as participants' expectations and researchers' biases. Although there is evidence from these studies that gait prioritization can assist people with PD to walk with faster and with longer steps while performing a second motor task, it is not known if this strategy is equally effective when the second task is cognitive in nature. The effects of gait prioritization on the severity of dual-task interference also require investigation.

Our study explored the immediate and short-term effectiveness of the gait prioritization strategy, using a controlled experimental design, in people with PD while they are combining a cognitive task with walking. We predicted that those who prioritized their attention to taking big steps would be able to walk faster and with longer strides. We also predicted that after 30-min training using gait prioritization, they would continue to walk faster and with longer steps in the short-term without instructional prompting. In addition, the magnitude of dual-task interference would decrease. The University of Melbourne (reference number 060128 and 0718399) and the Southern Health Human Research Ethics Committee (reference number 051328) approved this investigation and all participants provided informed consent prior to data collection.

2. Methods

2.1. Research design

This investigation was a single-session laboratory study using a non-randomized mixed design, with one between-subject factor (group) and two within-subject factors (task, time) (Fig. 1). There were two levels for the group factor (training group and control group), two levels in the task factor (single task and dual tasks) and three levels for the time factor (baseline, post-training, and delayed retention). The single-task condition involved either walking only or performing the cognitive task only, while the dual-task condition required walking and performing the cognitive task at the same time.

2.2. Participants

Twelve participants, all with PD (training group $n=6$, control group $n=6$) were recruited in the state of Victoria, Australia through our advertisements in regional Parkinson support groups,

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