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Letter to the Editor

Provoking Freezing of Gait in Clinical Practice: Turning in Place is More Effective than Stepping in Place

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Freezing of gait (FOG) is common and debilitating in Parkinson's disease (PD) [1], and significantly contributes to the occurrence of falls [2]. To prevent falls and fall-related injuries, timely detection of FOG in clinical practice is needed, as this can be the start of tailored interventions [3]. However, provoking FOG in a clinical environment is challenging, for several reasons. First, freezing is provoked by constraints in the physical environment, and the typically wide and well-lit hospital corridors are not ideal to provoke FOG. Moreover, clinicians are usually on a tight schedule and do not always have time to perform a complete FOG-provoking test battery [4]. It is therefore important to identify the most effective task to provoke FOG. Stepping in place and rapid turning on the spot are both effective ways to provoke FOG [5–8]. However, these two tests have not been compared back to back. Moreover, it is unknown whether combining both tests yields a higher sensitivity than either test alone.

To answer these questions, we included 16 patients with PD and subjective experience of daily FOG, as determined using the N-FOGQ [9]. Mean age of these patients was 70 years (range 51–89 years), with a mean disease duration of 10 years (range 3–20), mean MDS-UPDRS subsection III score of 36 (range 24–49) and mean N-FOGQ score of 19 (range 10–25). Hoehn and Yahr staging showed a modal score of 2 (range 2–4). All patients were examined in a practically defined OFF state, i.e., >12 hours after intake of the last dose of dopaminergic medication.

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The following tasks were performed once by each patient, for 30 seconds each: (a) stepping in place at self-selected speed; (b) making a rapid half turn (180°) in place; and (c) making a rapid full turn (360°) in place. The order of these tasks was balanced across patients. Between these tasks, a short rest period of five seconds was provided to give patients time to refocus on the next task. During the turning tasks, participants were instructed to perform ongoing half or full turns in alternating direction (leftwards and rightwards) by making small steps on the spot. Patients always started with a rightward turn. Measurements were videotaped for offline visual analysis, by two experienced raters.

All patients understood the test instructions and could perform all test conditions. Freezing was defined as an unintentional and episodic phenomenon during which no effective stepping movements were made [10]. The raters reached a perfect degree of agreement for presence of FOG within each task (agreement 100%, Cohen's kappa = 1). Overall, FOG was provoked in 15 out of 16 patients (93,8%). Hence, in one person, no FOG was elicited in all tasks. Both rapid half and rapid full turning in place provoked FOG in 14 patients (sensitivity of 0.88; CI 0.71–1.04). During the stepping in place condition, FOG was provoked in only six patients, and this test was significantly less effective in provoking FOG than both turning tasks (37.5% for stepping in place versus 87.5% for turning; Wilcoxon's $Z = -2.828$; $p = 0.005$). Combining both turning tasks elicited freezing in 15 patients, with a sensitivity of 0.94 (CI 0.82–1.06). Adding the stepping in place test to each turning test did not increase the sensitivity of provoking FOG.

We found that stepping in place had a sensitivity of 0.38 to provoke FOG, which is lower than in previous work (sensitivity of 0.87) [5]. As study populations were largely comparable in both studies, this discrepancy may be explained by task duration, because Nantel and colleagues [5] instructed their patients to perform the stepping test for a period of 300 seconds (three times 100 seconds), whereas we used a much shorter time frame of 30 seconds (this was done on purpose, with the aim of developing a brief test that would be feasible for use in a busy daily clinical practice). In contrast to the stepping in place test, our findings on the effectiveness of full rapid turns to provoke FOG (with a sensitivity of 0.88) are in accordance with two previous studies, which reported sensitivities of 0.64 and 0.65 [6, 8]. One of these studies reported that rapid full turns were superior to rapid half turns in provoking FOG [8], but we could not replicate this finding. This discrepancy may be explained in two ways. First, in the study of Snijders and colleagues [8], half turns were performed at the end of a walking trajectory, while full turns were performed from standstill. In our study, both half and full turns in place were performed from standstill and were not preceded by a walking trajectory. This hampers a clean comparison between turning angles and its effectiveness to provoke freezing. Second, and perhaps more likely, we included more severe freezers (as measured with the N-FOGQ) compared to Snijders and colleagues [8]. In severe freezers, rapid half turns may already be challenging enough to provoke FOG, whereas rapid full turns may be more effective in those with relative mild FOG. In line with previous findings [8], our results indicate that task repetition (combining rapid full and rapid half turns) yields a higher sensitivity of provoking FOG.

It should be noted that all patients were measured after withdrawal of dopaminergic medication. Future studies could evaluate the sensitivity of the turning tasks when patients are ON-medication, and in patients with less severe FOG. When aiming to provoke FOG in daily clinical practice (when the available time for physical examination is limited), we recommend to ask the patient to make rapid alternating 180 or 360 degrees turns on the spot (360 degrees being preferred for patients with milder freezing), and to repeat this when the first result is negative.

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