Shaken not Stirred: A Pilot Study Testing a Gyroscopic Spoon Stabilization Device in Parkinson's Disease and Tremor

Dear Sir,

As practising clinicians, patients frequently ask for advice regarding non-mainstream treatment modalities for their neurological conditions. With the vast array of information available to patients of varying quality and accuracy, we often forewarn caution for treatments without a robust evidence base.

This dilemma has led us to conduct a pilot study assessing a gyroscopic spoon stabilization device in 10 patients with Parkinson's disease (PD) with tremor.

There are currently multiple gyroscopic spoon assist devices on the market that advertise tremor cancellation technology to assist patients with tremor in eating tasks. These include the Liftware Steady Spoon and Gyenno Spoon. These devices attempt to stabilize spoon transfers using an embedded gyroscopic mechanism. Gyenno Science kindly donated their device for our testing [Figure 1].

Other assistive options for patients with tremor include large grip cutlery,[1,2] weighted cutlery,[1,2] weighted lead wrist cuffs,[1,2] and swivel spoons.[1] These devices have variable individualized efficacy and a paucity of published literature demonstrating objective functional improvement.

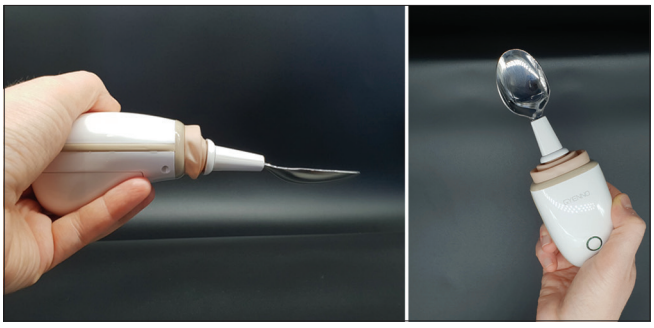

Figure 1: Gyenno Spoon, Gyroscopic Spoon Assist Device

Table 1: Patient Demographics (n=10)

Demographic	Result (Standard Deviation)	Range
Age, years	71.3 (6.8)	63-74
Gender (Male), %	9 (90%)	-
Daily Levodopa Equivalent Dose, mg	511.25 (228.4)	137.5mg - 987.5mg
Handedness (Right), %	10 (100%)	-
Dominant Disease Side (Right), %	8 (80%)	-
Duration of Parkinson's Disease, years	6 (5.3)	1-20
Treatment with a dopamine agonist (%)	3 (30%)	-
Dyskinesia (Number of patients) (%)	2 (20%)	-
Functional Impact of Dyskinesia	0.3 (0.67)	0-3
Time Spent with dyskinesia	0.2 (0.4)	0-1
Motor Fluctuations (%)	1 (10%)	0-1
Functional Impact of Fluctuations	0.1 (0.3)	0-1
MDS-UPDRS I score, raw score	11.8 (5)	1-14
MDS-UPDRS II score, raw score	10.18 (6.6)	0-23
MDS-UPDRS III score, raw score	28.8 (3.05)	26-36
MDS-UPDRS IV score, raw score	0.8 (1.9)	0-6
Hoehn and Yahr stage	All patients rated 2	-

MDS-UPDRS I=Non-Motor Experiences of Daily Living, MDS-UPDRS II=Motor Experiences of Daily Living, MDS-UPDRS III=Motor Examination, MDS-UPDRS IV=Motor Complications

Pathak *et al*. have shown the gyroscopic spoon assist device to be effective in a cohort of patients with essential tremor.[3] The gyroscopic device has also been shown to be

Table 2: Tremor Phenotyping of Cohort (n=10)

Tremor rating	Average Tremor Rating (Standard Deviation)	Range	Total Tremors Rated Across Cohort
3.15a, Postural RUE Tremor	0.8 (0.8)	0-2	6
3.15b, Postural LUE Tremor	0.5 (0.5)	0-1	5
3.16a Kinetic RUE Tremor	0.5 (0.7)	0-2	4
3.16b Kinetic LUE Tremor	0.6 (0.5)	0-1	6
3.17a Rest Tremor RUE Tremor	1.5 (1.2)	0-3	7
2.17b Rest Tremor LUE Tremor	0.4 (0.7)	0-2	3
3.18 Constancy of Rest Tremor	1.9 (0.6)	1-3	-

RUE=Right Upper Extremity, LUE=Left Upper Extremity

Table 3: Three-Attempt-Transfer-Task, Grams Transferred and Time Taken, difference calculated between assist device in on and off state

	Participant (P1-P10)									
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Grams Transferred, Difference between on state and off state	0	1	-3	-1	3	-9	0	-1	-1	-3
Time Taken, Difference between on state and off state	-2.6	-2	-2.6	4.7	0.5	-1.1	1.6	5.3	2.1	-2.2

Three-attempt-transfer-task, grams transferred (p 0.200, 95% CI [-3.69, 0.89]). Three-attempt-transfer-task, time taken (p 0.703, 95% CI [-1.757, 2.497])

Table 4: Sixty-Second-Timed-Transfer-Task, Grams Transferred, assist device on versus off state and difference calculated

	Participant (P1-P10)									
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
On state	118	127	112	96	112	113	180	125	155	131
Off state	129	141	127	138	105	128	192	150	160	130
*Difference (On-Off)	-11	-14	-15	-42	7	-15	-12	-25	-5	1

*Sixty-second-timed-transfer-task, (p 0.014, 95% CI [-22.81, -3.39]). Statistically significant result, less rice has been transferred with the device in the on state compared to the off state

the patient-preferred device in a head-to-head trial with large grip, weighted cutlery, and swivel spoon for a cohort of PD and essential tremor patients who self-reported difficulty with eating tasks.[1]

Our study recruited patients sequentially from the Parkinson's Disease Research Clinic at the Brain and Mind Centre, Sydney. All 10 patients had a confirmed diagnosis of PD[4] and significant levels of tremor as measured by the Movement Disorder Society, Unified Parkinson's Disease Rating Scale (MDS-UPDRS).[5] Patient selection was specifically designed to reflect the market of the device, that being all tremor. No other specific inclusion criteria were required.

The authors obtained ethics approval for this study before commencement through the University of Sydney Human Research Ethics Committee. Clinicians consented all participants before commencement of testing on the day. The patients were tested in their on state in the morning or afternoon (depending on their availability) following what they perceived as an adequate response to their usual medication at that time. Unfortunately, we had to exclude the data collected on two patients. One patient had shoulder pain during the testing and testing was ceased. The other patient had tremor predominantly in their non-dominant hand.

Table 1 presents patient demographics. Table 2 presents the cohort's tremor phenomenology with average ratings, calculated standard deviations, and median interquartile ranges.

Two timed functional assessment tasks tested the device switched on and off. We blinded the state of the device to the patients during testing. The *sixty-second-timed-transfer-task* involved transferring rice between two bowls 50 cm apart with the spoon over 60 s. The *three-attempt-transfer-task* involved a timed three spoon transfer of rice between the two bowls 50 cm apart. The patients repeated the tasks twice; the results presented are averages. Differences between grams transferred and time taken for the tasks with the device switched on and off were compared using a paired *t*-test [Tables 3 and 4].

The results for the *three-attempt-transfer-task* did not reach significance ($P < 0.05$) for the amount of rice transferred in grams or the time taken to achieve the task. Paradoxically, *less* rice was transferred with the device switched on compared with switched off for the *sixty-second-timed-transfer-task* ($P = 0.0138$, 95% confidence interval: −22.81 to −3.39). This result suggests that turning on the gyroscope in the device *decreased* the efficiency overall.

We postulate that the negative and non-statistically significant results obtained are due to the type and severity of tremor affecting the recruited PD cohort. Predominantly rest and low-amplitude postural tremor was noted [Table 2]. Indeed, it seems intuitive that the device would not significantly assist

patients with rest tremor. We would, therefore, argue that future research for these devices should focus on testing patients with tremors that are on average more severe and significantly affecting motor activity such as position-independent postural, severe kinetic, and task-specific tremor. This subset of patients may find improved functional outcomes using the device. In addition, patients were not provided any training time with the device before testing. We would recommend further studies into these devices allow for a period of motor learning before formal testing.

This pilot study suggests that clinicians should advise caution when patients are considering the purchase of tremor assist devices. Based on the results of this pilot study, we can make no recommendation for the widespread use of this device for patients with PD and tremor. Subgroups may find functional improvement if given enough practice time with the device; however, identifying this group will require further study.

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Conflicts of interest

There are no conflicts of interest.

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