



# Interrater Reliability of Dynamic Balance in Persons with Parkinson's Disease (PD)



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## Background

Stepping, sideways walk and turning are commonly used in rehabilitation program to improve balance in patients with balance deficits. These functional tasks are sequential locomotor movements that require dynamic balance to perform. Interrater reliability of step test, sideways walk and turns as measures of dynamic balance in persons with PD have not been reported.

## Purpose

To establish interrater reliability of the 5-step test, sideways walk and 360 turns as measures of dynamic balance in individuals with PD both on and off antiparkinsonian medication.

## Procedures

Nine subjects with PD were recruited. Sideways walking, 5-step, and turning tests were administered during on and off anti-parkinsonian medications on the same day. The average of two trials was used as definitive data.

### 5-Step test

For the 5-step test, the patient was timed while stepping up and back down a 10.2-cm (4-inch) step continuously for 5 times as fast as possible.

### 360 Turning

One of the testers demonstrated a 360-degree turning. Subjects then were asked to turn 360 degrees as fast as possible to the right and to the left. The test was repeated twice. To avoid a practice effect on physical performance, the sequence of the turning direction was alternated as follows: turning to the right, turning to the left, and turning to the right, and turning to the left. Time in seconds and the number of steps to complete each turn were recorded. The average of the two trials was used as definitive data.

### Walk Sideways

Subjects were instructed to walk sideway toward right and left at their fastest speed for 5 meter (16.40 feet). For the left sideward, they were asked to stand and place their left foot at the starting line and walked sideway toward the left. Each step was counted as one when the right foot was placed next to the left foot. Similar testing procedure and instruction were given for the right sideward. The two raters recorded time in seconds and the number of steps to complete the 5-meter distance.

## Results

Subject Characteristics (n=9)	Mean	SD
Age (yr)	69.63	5.52
Disease Duration (yr)	7.63	5.45
H&Y (on)	2.94	0.18
UPDRS III 'off'	34.75	8.48
UPDRS III 'on'	23.13	5.79

Measures	OFF			ON		
	Rater I	Rater II	ICC (2,1)	Rater I	Rater II	ICC (2,1)
5 step test (s)	13.11 ± 2.19	13.27 ± 1.84	.92	11.41 ± 2.53	11.45 ± 2.72	.99
Turn to Left -Time (s) -No. of Steps	6.05 ± 3.59 11.31 ± 5.96	6.24 ± 3.94 12.00 ± 6.20	.96 .98	4.47 ± 2.31 7.56 ± 3.82	4.62 ± 2.82 7.81 ± 4.03	.97 .98
Turn to Right -Time (s) -No. of Steps	6.44 ± 4.85 12.63 ± 9.60	6.52 ± 4.45 13.06 ± 12.74	.99 .94	4.46 ± 2.54 7.00 ± 2.12	4.77 ± 2.92 7.44 ± 2.95	.98 .87
Left Sidewalk -Time (s) -No. of Steps	11.63 ± 4.86 12.83 ± 3.43	11.93 ± 4.69 12.91 ± 3.01	.99 .96	9.49 ± 3.70 11.08 ± 3.69	9.17 ± 3.51 11.41 ± 3.61	.99 .99
Right Sidewalk -Time (s) -No. of Steps	11.65 ± 2.65 13.00 ± 1.79	12.07 ± 2.91 13.42 ± 1.74	.99 .87	9.21 ± 3.1 10.50 ± 3.27	9.00 ± 3.46 10.75 ± 2.72	.97 .94

## Conclusion

The 5-step test, turning left and right, and sideway walk tests showed high interrater reliability in a sample of persons with PD both on and off medication testing. The three tasks could be clinical tools for evaluating dynamic balance in persons with PD.

# Association between Laterality of Onset and Degree of Speech Impairment in Parkinson's Disease

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## BACKGROUND

Audible quality of speech is distinctly impaired relatively early in Parkinson's disease (PD). The neural circuitry between the basal ganglia (BG) and the motor cortex is implicated in its pathogenesis. Research supports a probable dominance of left circuitry. However, the relative contribution of disease involving the left versus the right basal ganglia circuitry in causing speech deterioration in Parkinson's disease remains to be fully clarified.

## OBJECTIVE

In PD, using the laterality (right or left) of the motor disease emergence, as a clinical indicator of the relatively early contralateral basal ganglia involvement, this project explores the dominant BG circuitry with respect to speech, by studying the relationship between the side of asymmetric onset and the degree of speech impairment.

## METHODS

Using a standardized chart review approach, medical records of a cohort of consecutively evaluated PD patients, followed at Houston PADRECC were reviewed. The selected patient records contained evidence of asymmetric onset and an assessment of parkinsonism using the Unified Parkinson's Disease Rating Scale (UPDRS) at baseline visit. Based on the laterality of motor disease emergence, patients were grouped as: a) **Left Onset** or b) **Right Onset**.

Difference in speech scores between the two groups was analyzed using Chi-square analysis with continuity correction.

## RESULTS

### Comparison of UPDRS Speech Scores for the Left Onset (LO) and Right Onset (RO) PD Groups

UPDRS Speech Score	Left onset (LO)	Right onset (RO)
Scores 0-1 combined	60 (71.4%)	96 (57.5%)
Scores 2-4 combined	24 (28.6%)	71 (42.5%)
Total	84 (100%)	167 (100%)

Table 1

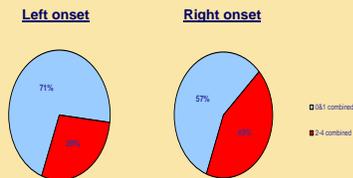


Figure A

## RESULTS

### Comparison of Relative Severity of Left and Right Disease between the L onset and R onset groups

UPDRS Motor sub-score	Left onset (LO)	Right onset (RO)
Left side worse	67 (79.8%)	34 (20.4%)
Right side worse	6 (7.1%)	115 (68.9%)
Both sides equal	11 (13.1%)	18 (10.8%)
Total	84 (100%)	167 (100%)

Table 2

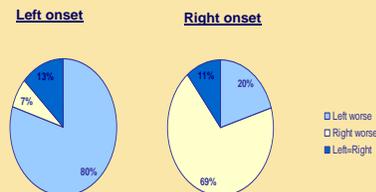


Figure B

Demographics	ALL	Left onset (LO)	Right onset (RO)
<b>Gender</b>			
Men	248 (98.8%)	82 (97.6%)	166 (99.4%)
Women	3 (0.3 %)	2 (2.4%)	1 (0.06%)
Total	251 (100 %)	84 (100%)	167 (100%)
<b>Ethnicity</b>			
White	204 (81.3%)	69 (82.1%)	135 (80.8%)
Black	28 (11.2%)	7 (8.3%)	21 (12.6%)
Hispanic	16 (6.4%)	7 (8.3%)	9 (5.4%)
Other	3 (1.2%)	1 (1.2%)	2 (1.2%)
<b>Age (at initial visit)</b>	70.7 (32.4 - 89.4)	70.3 (43.8 - 89.4)	70.8 (32.41 - 89.4)
<b>Handedness</b>			
Left	22 (8.8%)	14 (16.7%)	8 (4.8%)
Right	223 (88.8%)	69 (82.1%)	154 (92.2%)
Ambidextrous	2 (0.8%)	0 (0%)	2 (1.2%)
Unknown	4 (1.6%)	1 (1.2%)	3 (1.8%)

Table 3

## RESULTS

- A total of 321 PD patient records were reviewed. 251 (78%) had an asymmetric onset of disease. Right onset (RO) was seen in 167 (66.5%) and Left onset (LO) in 84 (33.5%) of the patients. Table 3
- In both RO and LO groups, significantly higher proportion of patients had worse disease on the corresponding side as compared to the contralateral side at baseline. Table 2, Figure B
- Moderate to severe speech impairment (UPDRS Scores 2-4) was noted in 71 patients (42.5%) in the RO and 24 (28.6%) in the LO groups. ( $p < 0.05$ ). Table 1, Fig A

## CONCLUSION

- Parkinson's Disease with **right asymmetric onset** is associated with significantly **greater speech impairment** at baseline than left asymmetric onset.
- Our data supports previous research suggesting a probable dominance of left basal ganglia circuitry in motor speech production.



# Deep Brain Stimulation Parameters and Gait in Parkinson's Disease

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## OBJECTIVE

To identify specific deep brain stimulation (DBS) parameters that improve gait in Parkinson's disease patients with bilateral DBS placement.

## BACKGROUND

Deep brain stimulation is a well established therapeutic option for Parkinson's disease. Several potential combinations of stimulation parameters (contact, voltage, pulse width, pulse frequency) are available for customized therapy.

However, there is no published research defining the efficacy of individual stimulation parameters with respect to improvement in various aspects of motor disease.

This project seeks to identify a specific deep brain stimulation parameter that improves gait without a concomitant change in other parameters.

## METHODS

Using a standardized chart review method, all available (40) medical records of PD patients with DBS surgery were reviewed. Thirteen (13) records met the inclusion criteria defined as :

- ❖ Bilateral DBS placement.
- ❖ No prior basal ganglia or thalamic surgery.
- ❖ At least one DBS programming session, where gait was tested using a standardized scale (Stand-Walk-Sit), with respect to a single stimulation parameter change.

The change in speed and stride length following change in a particular stimulation parameter was analyzed using Student's t test.

Fig: 1

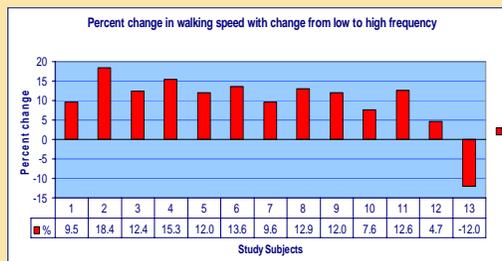


Fig: 2

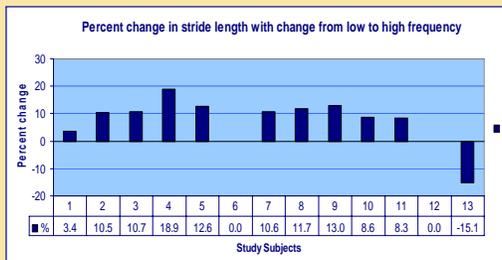
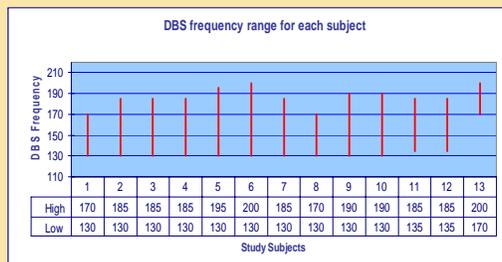


Fig:3



## RESULTS

- ❖ Deep brain stimulation frequency was identified in 13 out of 13 records as the "single specific" stimulation parameter that affected gait (Stand-Walk-Sit test ), without any associated programming change.
- ❖ Higher bilateral stimulation frequency (range 170- 200) was associated with an increase in walking speed in 12 out of 13 and increase in stride length in 10 out of 13 patients, as compared to the lower frequency (range 130-135) ( $p < 0.0002$ ,  $p < 0.0039$ , respectively) Fig: 1, Fig: 2, Fig: 3
- ❖ Two patients showed no change in stride length.
- ❖ One patient showed progressive reduction in both speed and stride length with increasing frequency, when tested in the upper range only (170-200). No data on him was available for the lower frequency range.
- ❖ Three patients had at least one episode of freezing, in at least one test trial, in the lower frequency range. All three patients showed improvement in freezing when tested in the higher frequency range.
- ❖ No immediate adverse effect pertaining to any aspect of functioning was documented with high frequency setting.

## CONCLUSION

- ❖ DBS stimulation frequency independently affects gait in PD patients with bilateral therapy.
- ❖ Higher bilateral frequency is associated with statistically significant increase in speed and stride length.
- ❖ Further exploration of this observation in a controlled setting is warranted.