

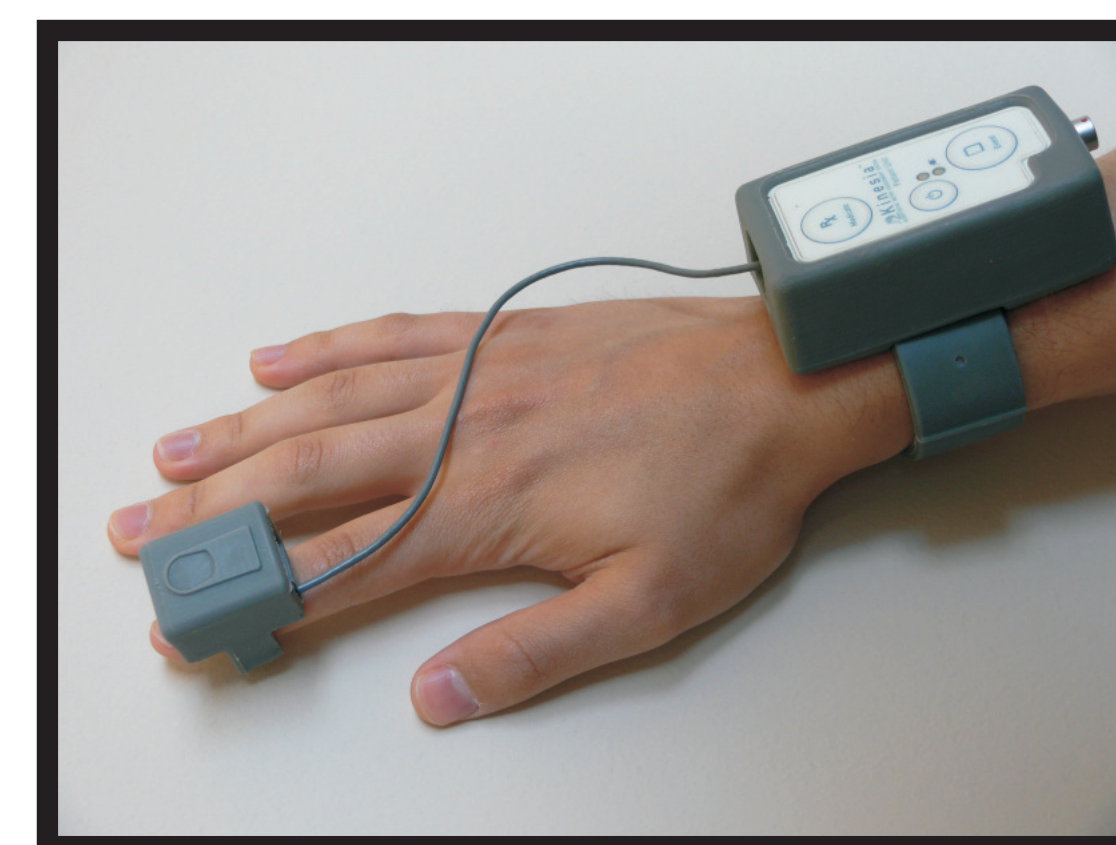
INTRODUCTION

Parkinson's disease (PD), a neurodegenerative disorder, can be characterized by its cardinal motor symptoms including tremor and bradykinesia. Once side effects of drug intervention outweigh therapy benefits, patients may consider receiving deep brain stimulation (DBS) surgery. Patients must then undergo extensive programming or "tuning" to adjust stimulation settings for optimal therapeutic benefit. Clinical rating scales, most commonly the Unified Parkinson's Disease Rating Scale (UPDRS), are used to evaluate PD symptom improvement in response to DBS. While DBS has shown efficacy to improve patient symptoms, there is significant room for improvement during outpatient programming such as providing a more quantitative assessment, especially for disparate PD populations without access to movement disorder specialists.

GOALS & METHODS

The objective was to evaluate feasibility of an automated system to assist with PD motor symptom assessment in response to DBS parameters during outpatient monopolar review by demonstrating the following:

- Technical feasibility of quantifying tremor and bradykinesia PD motor symptoms using a Kinesia™ wireless motion sensor system.
- Algorithm-suggested stimulation settings are highly correlated to clinical judgment.
- Clinical acceptance by positive feedback on clinical and patient questionnaires.

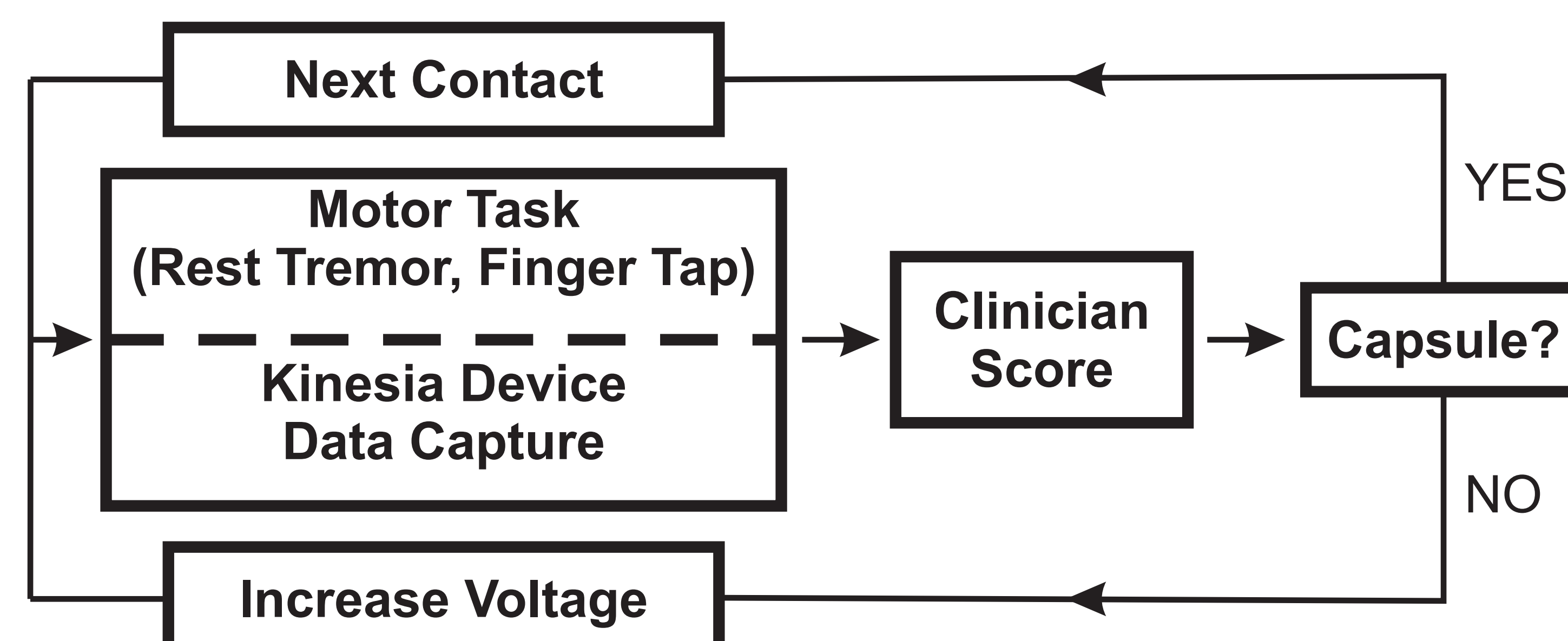


Kinesia™ consists of a finger-worn sensor unit that contains accelerometers and gyroscopes, and a wrist-worn command module that wirelessly transmits data to a computer.

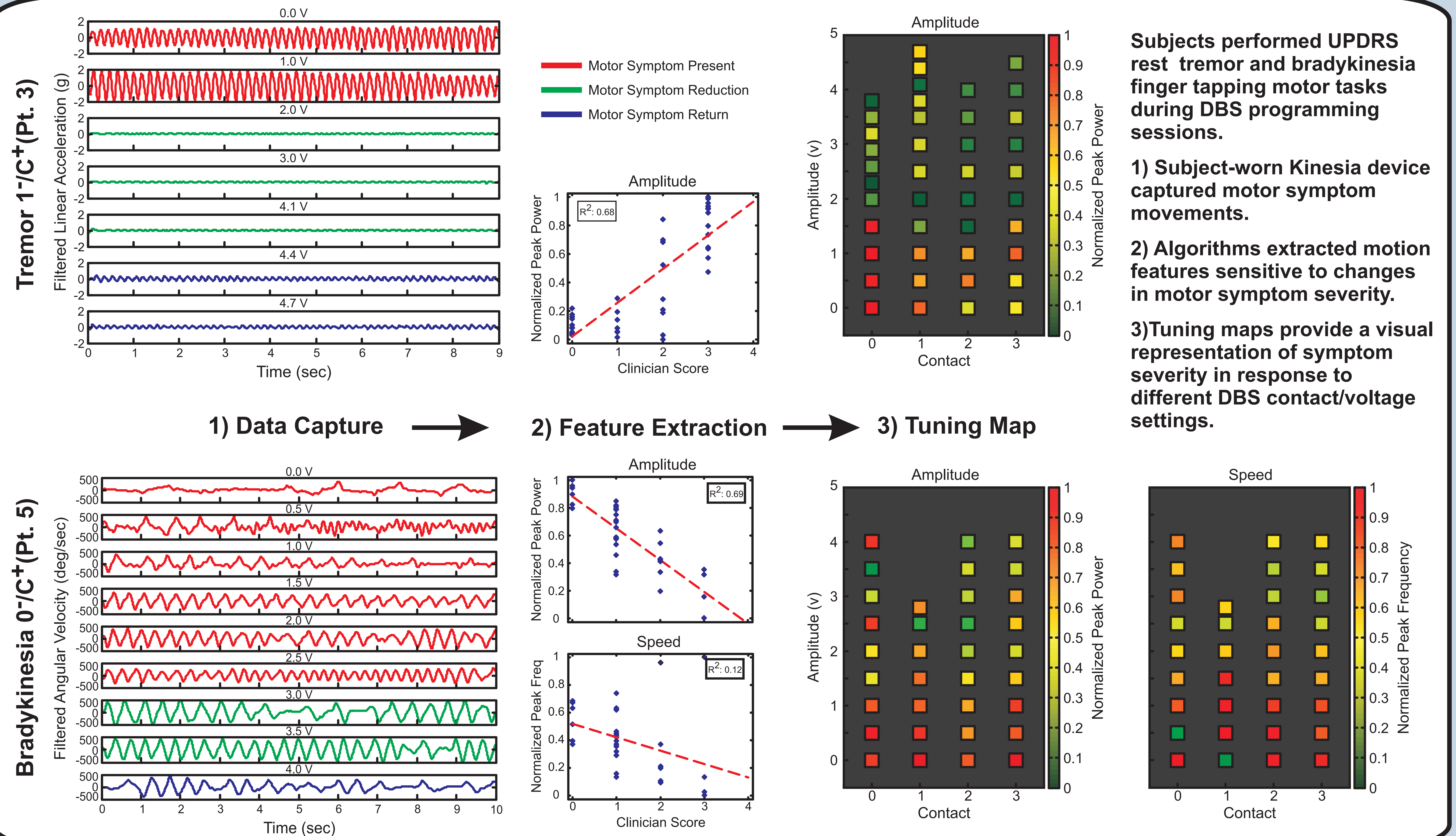
DBS Parameters

- Contact (0-3⁺/C⁺)
- Amplitude (0-5 V)
- Frequency (130 Hz)
- Pulse Width (60 μsec)

Subject Demographics			
ID	Sex	Age	DBS Target
1	F	54	L/R STN
2	M	63	L STN
3	M	57	R STN
4	F	67	L STN
5	F	75	R STN



MOTOR SYMPTOM ANALYSIS



DBS OPTIMIZATION

Subject	Clinician				ParkinTune		
	Contact-	Voltage	Clinician Score	ParkinTune Score	Contact-	Voltage	ParkinTune Score
1: L STN	1	2.3	0	1.3	2	1	0.4
1: R STN	1	2	0	1.0	1	1.6	0.8
2	2	2	0	0	1	0.5	0.4
3	2	2.5	0	0.6	2	1.5	0
4	1	2.2	0	0.5	2	1.5	0
5	1	2	0	0	2	1.5	0

→ Clinician final DBS contact/voltage settings (frequency 130Hz, 60μsec) and corresponding severity scores were recorded for each patient. The ParkinTune scores at clinician-selected settings and ParkinTune-derived final settings/scores are shown.

CONCLUSION

→ The Kinesia system effectively captured motion data collected during UPDRS outpatient DBS programming sessions.

→ ParkinTune-derived final DBS contact and voltage settings did not exactly match clinician final settings for rest tremor; however, results across all subjects demonstrated that the algorithm could achieve therapeutic benefit through stimulation with lower tremor scores and voltage settings.

→ The UPDRS finger tap task instructs subjects to tap with a large amplitude and speed. Study results confirmed that stimulation impacts both variables; however, amplitude demonstrated improved correlation to clinician scores.