

# Tremor assessments on the MDS-UPDRS show a high amount of clinically implausible recordings

Jennifer Olt\*, PhD, Cristian Sirbu, PhD, Meagan Farrel, PhD, Katrina Patrick, PhD, Cynthia McNamara, PhD  
Cronos Clinical Consulting Services, Inc. an IQVIA business



## Introduction and objective

The MDS-UPDRS Part III is the gold standard for assessing motor clinical signs in Parkinson's Disease (PD) [1]. The MDS-UPDRS Part III includes assessments of speech, facial expression, rigidity, tremor, bradykinesia, coordination, gait, and postural stability. Clinical raters must be trained to consistently rate patients on the MDS-UPDRS

Anecdotally, we have become aware of clinical raters not being intimately familiar with the nuances of scale administration for utilising the MDS-UPDRS. This risks undermining the reliability and interpretability of the scale. As such, we used data from an existing natural history study where clinical raters administered the MDS-UPDRS Part III to a large number of patients. We aimed to identify consistencies in reporting. Specifically, we explored clinically implausible findings across items on tremor and rigidity

We hypothesised that assessment of mild PD is more challenging, leading to higher error rates [2] which is further complicated by the ON and OFF state. Therefore, we analysed early PD patients, indicated by lower H&Y stage, and chose the baseline visits in the PPMI study

## Methods

We analysed baseline data from 464 PD patients in the longitudinal PPMI study (data cut: 28 July 2025, NCT044777851): 264 (56.9%) in ON and 200 (43.1%) in OFF states. Demographics are shown in Table 1. A two-sided chi-squared test compared inconsistency rates between ON and OFF states. Inconsistencies in tremor and rigidity lateralisation were counted; statistical analysis was not possible based on low number of findings. The sample represents early- to mid stage PD patients based on the H&Y stage combined with lower symptom prominence. Tremor inconsistencies: Defined as instances where tremor severity (item 3.17) is recorded without presence (item 3.18), or presence is noted without severity - In both ON and OFF medication states. (see Schematic 1: Large question mark for constancy and small question mark for presence in example limb Rigidity (3.3) and tremor (3.17) lateralisation inconsistencies: Defined as symptoms recorded only on the right upper extremity and left lower extremity or vice versa. (see Schematic 2: Affected limbs in Red)

Table 1 Participant demographics (Data cut 28 July 2025)

	285 unique PD patients at baseline		
Age (Mean +/-SD)	61.5 +/- 10.9 years (N=33)		
Sex (% Male/Female)	55% Male, 45% Female (N=49)		
Race/Ethnicity	White: 48	Hispanic/Latino: 8	Not reported: 229
MDS-UPDRS total score	20.5 +/- 11.6 (N=285)		
H&Y stage	Stage 0: 2 Stage 1: 77	Stage 2: 177 Stage 3: 25	Stage 4/5: 0 Missing: 4
On vs. Off state	On: 264	Off: 200	

## Conclusions and future directions

- Our findings reveal a high rate of inconsistencies in MDS-UPDRS tremor scoring, highlighting the need for improved rater training, protocol standardisation, and item-level data review. The lack of ON/OFF differences suggests medication state may not significantly influence inconsistency rates in early disease. Our findings differ from published research [1], especially for tremor inconsistencies that are significantly higher in our analysis. Possible explanations include higher proportion of inexperienced raters or sites. Our findings generally agree with notions that tremor is challenging to measure [3]
- Further analysis will reveal if a subset of sites is driving these inconsistencies or whether they are distributed evenly across the study centres
- Understanding inconsistency rates in early PD will inform rater training materials, oversight strategies and data capture design (edit check to prevent inconsistent entries at the point of data entry)
- Further investigation is warranted across other MDS-UPDRS items (e.g., postural instability and gait disturbance, change of lateralisation between visits)

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## Results

### Tremor inconsistencies in early PD patients

- The inconsistency rate was high with 153 errors in all 464 recordings (33%, includes ON and OFF state), see Figure 1.
- No significant difference in tremor inconsistencies was found between ON (31%, N=82) and OFF (35.5%, N=71) states [ $\chi^2(1)=1.015, p=.314$ ]

Schematic 1



### Rigidity and tremor lateralisation inconsistencies in early PD patients

- Figure 2 shows low inconsistency rates. For rigidity lateralisation we found 1 in 464 recordings, which was in the OFF state
- Tremor lateralisation inconsistencies occurred only 2 times in 464, again in OFF state only
- Due to the low number,  $\chi^2$  was not calculated

Schematic 2

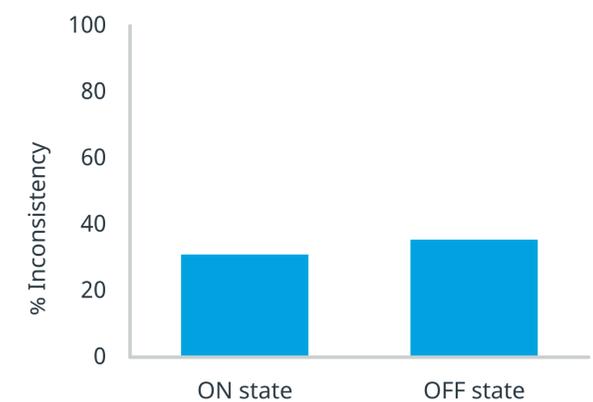


Figure 1 Percentage of error of tremor constancy and severity inconsistency

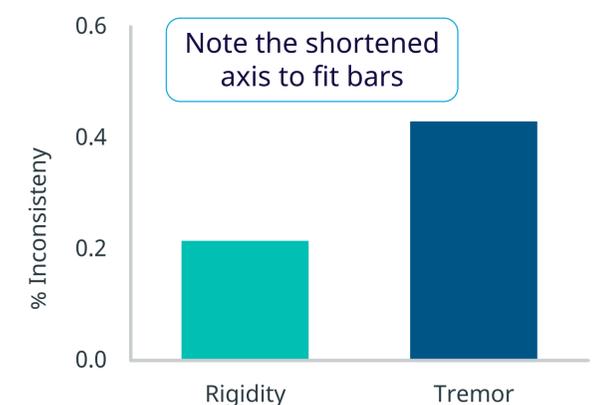


Figure 2 Percentage of error for rigidity and tremor lateralization inconsistencies

### References

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- [2] Turner, T.H. and Dale, M.L. (2020) 'Inconsistent Movement Disorders Society-Unified Parkinson's Disease Rating Scale Part III ratings in the Parkinson's Progression Markers Initiative'. *Movement Disorders*, 35(8), pp.1488-1489. doi:10.1002/mds.28108.
- [3] Kenny, L., Azizi, Z., Moore, K., Alcock, M., Heywood, S., Jonsson, A., McGrath, K., Foley, M.J., Sweeney, B., O'Sullivan, S., Barton, J., Tedesco, S., Sica, M., Crowe, C. and Timmons, S. (2024) 'Inter-rater reliability of hand motor function assessment in Parkinson's disease: Impact of clinician training'. *Clinical Parkinsonism & Related Disorders*, 11, Article 100278. doi:10.1016/j.prdoa.2024.100278.