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Title: Quantification characteristics of digital spiral analysis for understanding the relationship among tremor and clinical measures in persons with multiple sclerosis

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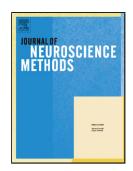
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Article Type: Research Paper

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Highlights

- Segment rate (SEGRT) is a novel measure to quantify tremor for a fine motor task.
- SEGRT has stronger sensitivity than the manual Archimedes Spiral.
- Objective measure of tremor in a large cohort of persons with Multiple Sclerosis.

Abstract

Background: Multiple sclerosis (MS) is a degenerative neurological condition causing demyelination and neuronal loss. Tremor, a symptom of MS, is prevalent in 45.0-46.8% NARCOMS registrants. Although several tools to measure tremor exist, few outcomes are quantitative or regularly utilized clinically.

New Method: Introduction of a novel adaptation of the digital spiral drawing to find a quick, sensitive, and clinically useful technique, to predict tremor in persons with MS (pwMS). Digital spiral measures included: Segment Rate (SEGRT), Standard Deviation (SD) of Radial Velocity (VSD-R), SD of Tangential Velocity (VSD-T), SD of Overall Velocity (VSD-O), Mean Drawing Velocity (MNV-O) and Mean Pen Pressure Acceleration (MNA-P). Digital spiral measures were compared with the manual Archimedes Spiral (AS) drawing and the following clinical measures: Finger-Nose Test (FNT), presence of visually observed intention tremor (VOT), Nine-Hole Peg Test (NHPT), and Box and Block Test (BBT).

Results: All clinical measures utilized demonstrated significant relationships with all digital variables, except VSD-R. The forward-stepwise regression revealed BBT accounted for the most variance, followed by SEGRT.

Comparison with Existing Methods: SEGRT is more sensitive in detecting VOT and better for quantifying tremor than AS. BBT and SEGRT are optimal predictive measures for tremor.

Conclusions: SEGRT has stronger sensitivity and negative predictive value than AS in detecting VOT. All clinical measures (NHPT, FNT, BBT, and AS) were significantly associated with the digital variables (SEGRT, VSD-T, VSD-O, MNV-O, and MNA-P) except for VSD-R. After

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