Essential Tremor Quantification During Activities of Daily Living

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Background: Essential tremor (ET), characterized primarily by postural and kinetic tremor, is typically measured in the clinic with subjective tremor rating scales. These ratings are often used to adjust medications and assess efficacy in clinical trials. However, tremor ratings require the presence of a clinician and do not necessarily capture tremor fluctuations throughout the day during activities of daily living (ADL).

Objective: To evaluate the ability of motion sensors to discriminate tremor from voluntary posture and motion, classify tremor as postural or kinetic, and rate tremor severity during standardized tasks and non-standardized activities of daily living.

Methods: Ten subjects with ET wore motion sensors on the index finger and performed standardized motor tasks from the Washington Heights-Inwood Genetic Study of Essential Tremor (WHIGET) tremor rating scale (wTRS) and non-standardized ADL tasks. Four movement disorder specialists independently rated video segments of the standardized tasks but not the ADL tasks. Quantitative features were extracted from the motion sensors and used to develop mathematical models for predicting rating scores from kinematic data.

Results: The quantitative motion features were highly correlated with wTRS ratings for postural (r=0.90) and kinetic (r=0.80) tremors. Mathematical models produced tremor ratings that correlated strongly with clinician ratings of the wTRS tasks (mean r=0.80) and also produced ADL task ratings that correlated well with the most recent clinician wTRS ratings (mean r=0.72).

Conclusions: Recordings from motion sensors can be used to classify tremor as postural or kinetic and quantify tremor severity during both standardized and non-standardized activities.