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Validation of a Portable Instrument for Assessing Tremor Severity in Epidemiologic Field Studies

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Summary

BACKGROUND: An important part of epidemiologic and genetic studies of essential tremor (ET) is an assessment of tremor severity. Clinical rating scales are semiquantitative and computerized tremor analysis, available at tertiary medical centers, is not transportable into the field. As part of an epidemiologic study, we modified the Klove-Matthews Motor Steadiness Battery, collecting objective quantitative data on tremor severity in patients with ET and control subjects.

OBJECTIVE: To describe the modified Klove-Matthews Motor Steadiness Battery, validate this test battery against several other measures of tremor severity, demonstrate test–retest reliability, and provide standard reference values for normal control subjects and patients with ET who undergo this test battery.

METHODS: Patients with ET and control subjects, ascertained from both a clinic and a community, underwent a standardized evaluation including a demographic and medical questionnaire, tremor disability questionnaire, videotaped tremor examination, performance-based test, modified Klove-Matthews Motor Steadiness Battery (Groove-Type Steadiness Tester [GTST] and Nine-Hole Steadiness Tester [NHST]), and quantitative computerized tremor analysis.

RESULTS: There were 19 patients with ET and 28 control subjects. NHST and GTST total scores were correlated significantly with the tremor disability questionnaire score ($r = 0.63$, $p = 0.001$ and $r = 0.49$, $p = 0.016$), total tremor score (tremor examination, $r = 0.68$, $p < 0.001$ and $r = 0.41$, $p = 0.005$), performance-based test score ($r = 0.81$, $p < 0.001$ and $r = 0.65$, $p = 0.001$), and quantitative computerized tremor analysis results (for example, spiral drawing, $r = 0.62$, $p = 0.01$ and $r = 0.58$, $p = 0.019$). Test–retest reliability was generally high ($r = 0.79$–0.94, $p < 0.001$).

CONCLUSION: The modified Klove-Matthews Motor Steadiness Battery provides a reliable and valid means to collect objective quantitative data on tremor severity. Rapidity of administration and ease of transport make it a potentially useful tool in epidemiologic and genetic field studies.

Key Words: Essential tremor—Epidemiology—Validity—Klove-Matthews—Quantification.

Assessing the severity of action tremor is an important part of epidemiologic and genetic field studies as well as clinical trials in essential tremor (ET).[1–7] Current methods are mainly semiquantitative (that is, clinical rating scales that rely on ordinal ratings anchored on descriptive terms such as "mild," "moderate," or "severe").[1,8–11] Quantitative computerized tremor analysis with sophisticated equipment has been used in a number of studies[5,12–15] to provide precise quantitative data on tremor amplitude and frequency; however, the equipment is limited to tertiary medical centers and is not transportable into the field for use in epidemiologic studies. A digitizing tablet,[12,13] which is transportable, may be used to assess some aspects of action tremor (for example, handwritten lines or spirals) but not others. As part of an epidemiologic study of ET,[17] we modified the Klove-Matthews Motor Steadiness Battery[18,19] to collect objective quantitative data on tremor severity. This instrument was initially developed to aid in the examination of tremor and motor performance in children with disordered brain function.[18,19] The test instruments may be transported easily and their design is simple (they do not require an electrical outlet or computer). In this study, we provide a detailed description of this test battery; validate the test battery against other measures of tremor severity,

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including a questionnaire, a clinical rating scale, a performance-based test of function, and quantitative computerized tremor analysis; demonstrate test–retest reliability; and provide standard age-stratified reference values for normal control subjects and patients with ET who underwent this test battery.

METHODS

Subjects

Subjects were participating either in the Columbia University Assessment of Disability in Essential Tremor,[17] a study of the functional correlates of ET which ascertains patients and control subjects from both a community (the Washington Heights-Inwood community in northern Manhattan, NY) and a clinic (the Center for Parkinson's Disease and Other Movement Disorders at Columbia-Presbyterian Medical Center [CPMC], New York, NY) or the Washington Heights-Inwood Genetic Study of Essential Tremor,[1] a familial aggregation study of ET which ascertains subjects from the Washington Heights-Inwood community. We enrolled 1.5 control subjects per patient with ET. For the present study, we wanted to ensure that the patient and control groups had similar age distributions because variability in the characteristics (for example, frequency, amplitude) of tremor is age-dependent.[11,20–23] We stratified participants by age (21–60 years versus 61 years and older) and enrolled 1.5 control subjects per patient. All subjects agreed to participate and signed a consent form approved by the CPMC ethics committee (Internal Review Board). All diagnoses of ET were based on a standardized evaluation which included a 10- to 30-minute semistructured tremor interview, a 10-minute videotaped tremor examination, followed by a diagnosis by one of the authors (EDL) using a standardized diagnostic protocol.[1,17]

Study Procedure

All 47 subjects underwent an in-person evaluation either in their homes or at CPMC, including a demographic and medical questionnaire, a videotaped tremor examination, and a Klove-Matthews Motor Steadiness Battery. The 24 subjects who had participated in the Columbia University Assessment of Disability in Essential Tremor also had a tremor disability questionnaire and a performance-based test of function, and the 16 subjects who were evaluated at CPMC also underwent quantitative computerized tremor analysis.

Demographic and Medical Questionnaire

A 16-item, 5-minute, semistructured questionnaire was developed to collect demographic information, data on exposures to caffeinated coffee and tea, soda, alcohol, and cigarettes on the day of testing, and use of asthma inhalers and other tremor-inducing medications.

Self-Reported Tremor Disability Questionnaire

This 31-item questionnaire[17] assessed the functional impact of tremor (Appendix). Items were rated as follows: 0 = no disability, no need to modify activities, and no loss of efficiency; 1 = no disability but a need to modify or a loss of efficiency; or 2 = disability or both a need to modify and a loss of efficiency. The total score was converted to a percentage (range = 0%–100% [maximally impaired]).[17] If an item was missing or not applicable, the denominator was adjusted before converting to a percentage.

Videotaped Tremor Examination

A videotaped tremor examination was reviewed by a neurologist specializing in movement disorders (EDL) who rated the tremor during sustained arm extension, pouring water, drinking water, using a spoon, the finger-to-nose maneuver, and drawing spirals.[1,10,11,17] Tremor was rated using a four-point scale: 0 = no visible tremor, +1 = a low-amplitude tremor was barely perceivable or was intermittent, +2 = tremor was of moderate amplitude and was usually present and clearly oscillatory, or +3 = large-amplitude, jerky tremor resulting in difficulty completing the task as a result of spilling or inability to hold a pen to paper. A total tremor score (range = 0–36 [maximum tremor]) was assigned to each subject based on the 0 to +3 ratings for 12 items (six items performed with each arm = 12).[1,10,11,17] The reliability of this rating scale has been demonstrated (K_w = 0.62–0.78, indicating substantial interrater agreement).[24]

Performance-Based Test

This 15-item, 10-minute test included the performance of activities that might be impaired by action tremor (for example, pouring, threading a needle, buttoning buttons, using a key).[17] Each item was scored by a trained rater (LFB or KJW) from 0 (no difficulty) to 4 (unable to perform) and the total score was converted to a percentage (range = 0–100 [maximally impaired]).[17] This test has been validated against clinical ratings (videotaped tremor examination, $r = 0.71$, $p < 0.001$) and quantitative computerized tremor analysis results ($r = 0.51–0.89$, $p \leq 0.008$).[17]

Klove-Matthews Motor Steadiness Battery

As initially published,[18,19] the full battery included seven tests of motor coordination or tremor. We modified the test battery by selecting items that best assessed action tremor and by making allowances for fatigue during testing. All subjects were seated in a stationary chair with the instruments placed directly in front of them on

a flat table. A tester (EY or LFB) was trained by the study physician (EDL) to administer the tests. Each test was performed with the subject's dominant arm. During testing, the subject was not allowed to lean their dominant arm, elbow, or wrist on the table or steady it in any way (for example, by using two hands). All subjects underwent the following two-part, 15-minute test protocol.

1. *Groove-Type Steadiness Tester* (GTST; Model 32010, Lafayette Instrument, Lafayette, IN, USA) assessed kinetic tremor. The unit consisted of two adjustable steel plates which formed the sides of a progressively narrowing groove. The distance between the steel plates was 0.625″ at one end and 0.125″ at the other end. The unit was placed flatly on the table and oriented so that the 0.625″ opening was on the subject's left. The subject moved a hand-held metal-tipped stylus (diameter = 0.0625″, Model 32100, Lafayette Instrument, Lafayette, IN, USA) horizontally from left to right through the gradually narrowing groove without touching the steel sides of the groove. Any contact between the stylus and the steel wall of the groove completed a circuit and was recorded by a battery-operated Silent Impulse Counter (Model 58023, Lafayette Instrument, Lafayette, IN, USA). The Impulse Counter recorded the number of contacts between the stylus and the wall. First, the tester showed the subject how to perform the task and answered any questions. The subject was then allowed one practice trial. Then the subject completed four repetitions.
2. *Nine-Hole Steadiness Tester* (NHST; Model 32011, Lafayette Instrument, Lafayette, IN, USA) assessed postural tremor. This consisted of a vertical metal plate with nine holes of gradually diminishing size (diameters = 0.5, 0.312, 0.25, 0.187, 0.156, 0.125, 0.109, 0.093, and 0.078″). The subject was asked to hold the hand-held, metal-tipped stylus (diameter = 0.0625″, Model 32100, Lafayette Instrument, Lafayette, IN, USA) in the hole for 10 seconds without touching the metal sides. Any contact between the metal-tipped stylus and the steel wall of the hole completed a circuit and was recorded by a battery-operated Silent Impulse Counter. The Impulse Counter recorded the number of contacts between the stylus and the wall. The tester showed the subject how to perform the task and answered any questions. The first of six holes was selected (diameter = 0.5″). The subject was then allowed one practice trial followed by four repetitions. The same procedure (one practice trial and four repetitions) was repeated using five additional holes (diameters = 0.312, 0.25, 0.187, 0.156, and 0.125″). The subject was asked to rest for 60 seconds between each of the holes. Hence, for each subject, data were collected from 30 trials (one practice trial and four repetitions for each of six holes). Because of their small diameter, the smallest three holes were not tested because contact between the stylus and the metal plate was virtually continuous.

Quantitative Computerized Tremor Analysis

These studies were performed by one of us (SLP or QY) in the Motor Neurophysiology Laboratory at CPMC.[25–27] The tremor analysis involved the use of ultralight piezo-resistive miniature triaxial accelerometers (±25 g, 0.5 gm) with linear sensitivities of approximately 4.5 mV/g in the physiological range which were attached to a proximal and distal position on each arm (that is, the distal humerus and the dorsum of the hand at the distal end of the middle metacarpal bone). Silver/silver chloride electromyogram (EMG) surface electrodes were used to record activity of the flexor carpi radialis and extensor carpi radialis muscles along with the accelerometry. Accelerometric and EMG signals were digitized at 500 Hz using a 15 msec 16-bit A/D system and stored in eight 4-second trials during different conditions (arms extended and drawing spirals). Tremor was sampled over a 30 minutes to record variation over time. Tremor amplitudes were derived off-line by double integration of wrist accelerometric data after filtering out low-frequency drift (<2 Hz) and averaging. EMGs were full-wave rectified, integrated, and processed with the accelerometric data.[25–27]

Data Analysis

For the GTST and the NHST, total scores were calculated by summing results from each of the separate trials (excluding the practice trials). Student's *t* test and chi-square statistic were used to test for significance. Pearson's correlation coefficients assessed continuous variables, and for these analyses, because data were not necessarily normally distributed, the square root for each observation was used.

RESULTS

Subject Characteristics

There were 47 subjects (19 patients with ET and 28 control subjects). The age of cases (62.2 ± 23.7 [mean ± standard deviation]) was similar to that of control subjects (59.1 ± 23.5, $t = 0.4$, $p = 0.67$). All 47 subjects had clinically detectable tremor (total tremor score ≥1); this tremor was more severe among patients with ET (mean total tremor score among patients with ET = 16.8 ± 5.3 versus 4.4 ± 3.4 among control subjects, $t = 9.7$,

p <0.001). Three (15.7%) patients and no control subjects were taking medication to suppress their tremor (χ^2 = 4.7, p = 0.03). There were no differences between patients with ET and control subjects in terms of coffee, tea, cola drinks, or cigarette consumption on the day of testing. No subject had used alcohol that day. Two patients and two control subjects used a tremor-inducing medication (for example, synthroid, theophylline, asthma inhaler).

Validation of the Groove-Type Steadiness Tester (GTST)

Among the 47 subjects, the GTST total score was correlated significantly with the NHST total score (r = 0.71, p <0.001, see Fig. 1), the tremor disability questionnaire score (r = 0.49, p = 0.016), the total tremor score (videotaped tremor examination, r = 0.41, p = 0.005), the performance-based test score (r = 0.65, p <0.001), and quantitative computerized tremor analysis results (including maximum tremor amplitude in the dominant arm during sustained arm extension r = 0.55, p = 0.028 [proximal lead], r = 0.52, p = 0. 038 [distal lead]), and during spiral drawing (r = 0.58, p = 0.019 [distal lead], see Fig. 2). The correlation between the GTST total score and the maximum tremor amplitude in the dominant arm during spiral drawing (proximal lead, quantitative computerized tremor analysis) was 0.09 (p = 0.74).

Among the 19 patients with ET, the GTST total score was correlated significantly with the NHST total score (r = 0.78, p <0.001) and the performance-based test score (r = 0.64, p = 0.008). Correlations with the tremor disability questionnaire score (r = 0.43, p = 0.09) and the total tremor score (videotaped tremor examination, r = 0.35, p = 0.14) did not reach statistical significance with this smaller sample size. Nine of the patients with ET underwent quantitative computerized tremor analysis, with the GTST total score correlating with maximum distal tremor amplitude in the dominant arm during spiral drawing (r = 0.69, p = 0.039) and during sustained arm extension (r = 0.63, p = 0.06). The correlation between GTST total score and maximum proximal tremor amplitude in the dominant arm during sustained arm extension among these nine patients was similar to the correlation for the entire group (r = 0.56), but this did not reach significance (p = 0.12) given the sample size. The correlation between GTST total score and maximum proximal tremor amplitude in the dominant arm during spiral drawing was not significant (r = 0.26, p = 0.50).

Validation of the Nine-Hole Steadiness Tester (NHST)

Among the 47 subjects, the NHST total score was correlated significantly with the tremor disability questionnaire score (r = 0.63, p = 0.001), the total tremor score (videotaped tremor examination, r = 0.68, p <0.001), and the performance-based test score (r = 0.81, p <0.001). The correlation between the NHST total score and the maximum tremor amplitude in the domi-

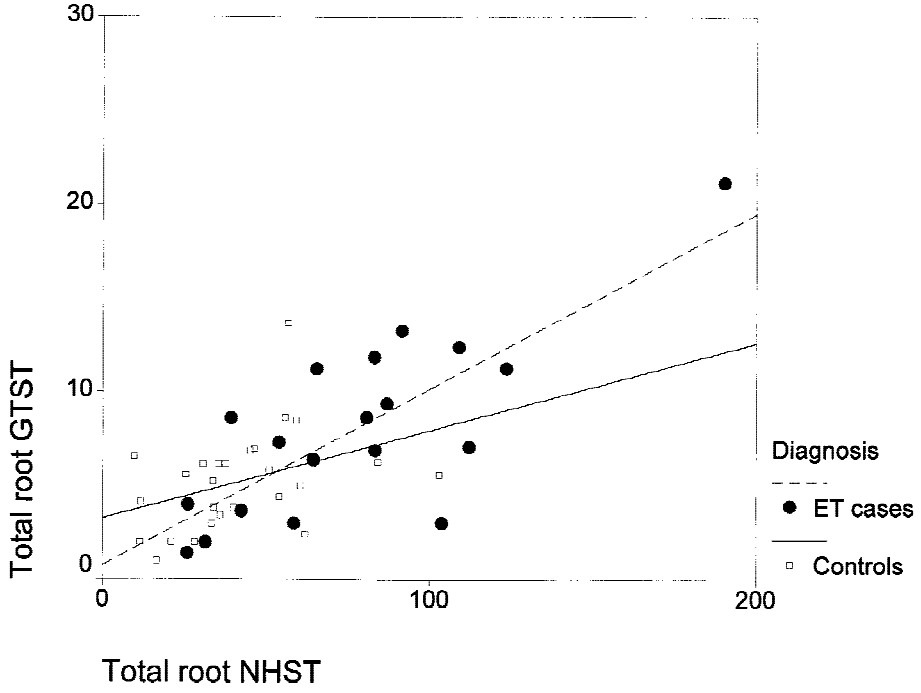

FIG. 1. Correlation between the total root GTST score versus total root NHST score. Patients with ET and control subjects are plotted separately. For patients, r = 0.78 (p <0.001). For control subjects, r = 0.39 (p = 0.05).

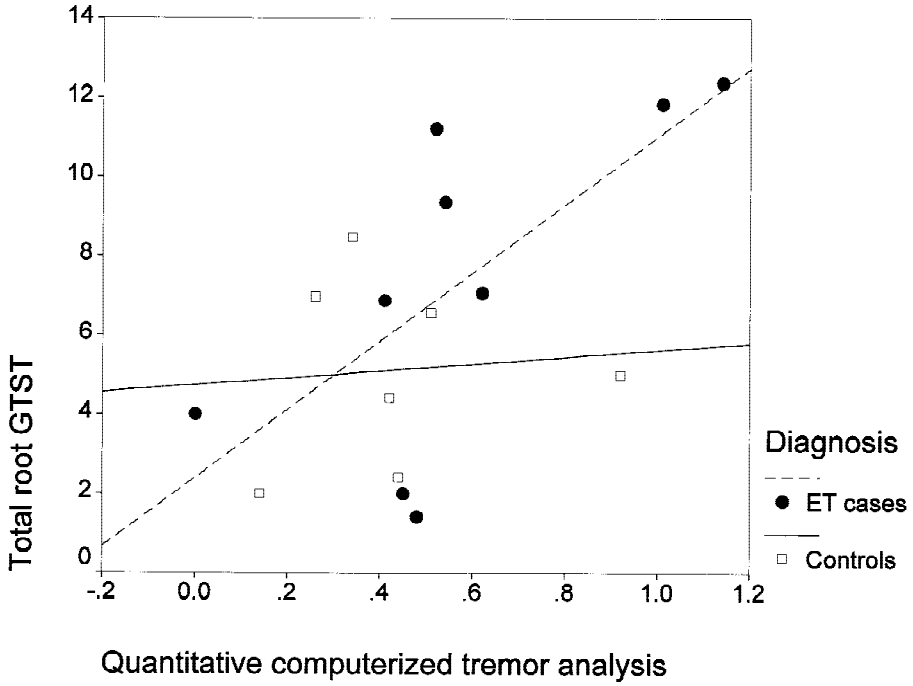

FIG. 2. Correlation between the total root GTST score versus computerized tremor analysis results (maximum distal tremor amplitude in the dominant arm during spiral drawing). Patients with ET and control subjects are plotted separately. For cases, r = 0.69 (p = 0.039). For control subjects, r = 0.10 (p = 0.85).

nant arm during spiral drawing (distal lead, quantitative computerized tremor analysis) was 0.62 (p = 0.01). The correlation between the NHST total score and other quantitative computerized tremor analysis results were of borderline significance (including maximum tremor amplitude in the dominant arm during sustained arm extension, r = 0.48, p = 0.06 [proximal lead], r = 0.48, p = 0. 06 [distal lead]), and during spiral drawing (r = 0.44, p = 0.09 [proximal lead]).

Among the 19 patients with ET, the NHST total score was correlated significantly with the tremor disability questionnaire score (r = 0.57, p = 0.02), the total tremor score (videotaped tremor examination, r = 0.61, p = 0.006), and the performance-based test score (r = 0.81, p <0.001). Nine of these underwent quantitative computerized tremor analysis with the NHST total score correlating with maximum distal tremor amplitude in the dominant arm during spiral drawing (r = 0.67, p = 0.048). The correlation between NHST total score and maximum proximal (r = 0.50, p = 0.17) and distal (r = 0.59, p = 0.10) tremor amplitude in the dominant arm during sustained arm extension, and maximum proximal tremor amplitude in the dominant arm during spiral drawing (r = 0.59, p = 0.10) did not reach significance given the sample size.

Test–Retest Reliability

After a practice trial, subjects completed four repetitions. Test–retest reliability (for each item, agreement among repetitions 1, 2, 3, and 4) was high: GTST (r = 0.74–0.79, p <0.001, except for one r = 0.39 with p = 0.10), NHST 0.5″ hole (r = 0.84–0.90, p <0.001), NHST 0.312″ hole (r = 0.82–0.94, p <0.001), NHST 0.25″ hole (r = 0.83–0.91, p <0.001), NHST 0.187″ hole (r = 0.79–0.93, p <0.001), NHST 0.156″ hole (r = 0.86–0.91, p <0.001), and NHST 0.125″ hole (r = 0.88–0.90, p <0.001).

GTST and NHST Test Scores (Patients versus Control Subjects)

While the mean scores differed between patients with ET and control subjects, there was extensive overlap in ranges (Tables 1 and 2).

DISCUSSION

A simple, rapid, and easily transportable means to objectively quantify the severity of action tremor is important in epidemiologic and genetic field studies of ET and other forms of tremor (for example, normal physiological tremor). Quantitative data on tremor severity may be used for a variety for purposes in these types of studies including diagnosis, making inferences about the duration of tremor and the degree of phenotypic expression of susceptibility genotypes, and assessing dose–response relationships between environmental risk factors (for example, toxins) and severity of disease. In these settings, researchers need to collect data that are more precise than can be provided by clinical ratings of “mild,” “moderate,” or “severe.” The Klove-Matthews Motor Steadiness

TABLE 1. *Mean (range, standard deviation) number of contacts between stylus and test instruments*

	Control subjects (N = 28)	ET (N = 19)	Significance
GTST	9.1 (1–48, 9.0)	24.2 (2–115, 25.7)	t = 2.87, p = 0.006
NHST Hole 1	0.8 (0–9, 2.2)	26.2 (0–199, 55.4)	t = 2.43, p = 0.019
NHST Hole 2	6.6 (0–52, 12.5)	39.5 (0–280, 80.1)	t = 2.15, p = 0.037
NHST Hole 3	9.9 (1–50, 14.2)	56.4 (0–292, 87.7)	t = 2.76, p = 0.008
NHST Hole 4	22.4 (0–132, 27.7)	86.3 (0–264, 86.5)	t = 3.66, p = 0.001
NHST Hole 5	37.5 (0–121, 30.5)	96.2 (0–280, 82.6)	t = 3.44, p = 0.001
NHST Hole 6	63.2 (9–201, 38.1)	125.5 (0–299, 84.6)	t = 3.33, p = 0.002

ET, essential tremor; GTST, groove-type steadiness tester; NHST, nine-hole steadiness tester.

Battery was initially developed to aid in the examination of tremor and motor performance in children with disordered brain function.[18,19] It has never been validated as a measure of tremor severity.

We demonstrated that the test battery is a reliable and valid measure of tremor severity, correlating significantly with a variety of independent measures of tremor severity, including a self-reported tremor disability questionnaire, a neurologist's clinical rating of a tremor examination, a performance-based test of function, and several results from quantitative computerized tremor analysis. Because they are easily transportable, we think these instruments could play a role in a variety of epidemiologic and genetic studies that occur in the field.

An important point is that the instrument quantifies motor steadiness rather than tremor frequency or ampli-

TABLE 2. *Mean number (range, standard deviation) of contacts stratified by age*

	Control subjects (N = 28)	ET (N = 19)
GTST		
21–40 yrs	6.0 (1–13, 4.2), N = 7	6.2 (4–9, 1.9), N = 5
41–60 yrs	4.8 (2–10, 3.6), N = 5	22.3 (14–34, 10.4), N = 3
61–80 yrs	11.5 (3–48, 12.7), N = 11	21.0 (2–40, 15.4), N = 6
>80 yrs	12.8 (7–19, 5.4), N = 5	47.2 (17–115, 39.2), n = 5
NHST Hole 1		
21–40 yrs	0.0 (0–0, 0)	0.2 (0–1, 0.5)
41–60 yrs	1.4 (0–7, 3.1)	99.3 (0–199, 99.5)
61–80 yrs	0.5 (0–3, 0.9)	1.8 (0–5, 2.2)
>80 yrs	2.0 (0–9, 3.9)	37.4 (0–130, 54.5)
NHST Hole 2		
21–40 yrs	1.6 (0–4, 1.6)	1.0 (0–2, 1.0)
41–60 yrs	8.6 (0–42, 18.7)	88.7 (1–246, 136.6)
61–80 yrs	7.9 (0–52, 15.0)	14.8 (0–23, 8.2)
>80 yrs	9.0 (0–22, 8.9)	78.7 (11–280, 114)
NHST Hole 3		
21–40 yrs	4.3 (0–12, 4.2)	29.4 (0–136, 29.4)
41–60 yrs	8.6 (0–39, 17.1)	104.3 (6–292, 162.6)
61–80 yrs	11.8 (0–50, 15.9)	34.5 (1–69, 23.2)
>80 yrs	15.0 (0–45, 17.8)	80.8 (9–282, 114.4)
NHST Hole 4		
21–40 yrs	12.0 (1–25, 8.7)	54.2 (6–209, 87.1)
41–60 yrs	21.2 (2–72, 28.9)	91.3 (2–237, 127.2)
61–80 yrs	25.6 (0–132, 36.6)	103.7 (0–203, 72.0)
>80 yrs	30.8 (6–64, 23.7)	94.6 (21–264, 98.1)
NHST Hole 5		
21–40 yrs	19.1 (1–37, 15.1)	60.8 (15–175, 67.0)
41–60 yrs	37.6 (2–99, 37.0)	41.0 (0–114, 63.4)
61–80 yrs	46.5 (0–121, 37.9)	142.0 (39–235, 78.0)
>80 yrs	43.4 (31–58, 10.8)	109.6 (49–280, 96.9)
NHST Hole 6		
21–40 yrs	49.3 (12–68, 19.9)	116.8 (32–217, 70.5)
41–60 yrs	57.6 (9–96, 35.3)	66.3 (0–196, 112.3)
61–80 yrs	72.9 (19–201, 53.2)	150.5 (46–277, 81.3)
>80 yrs	65.8 (33–88, 20.8)	139.6 (78–299, 93.6)

GTST, groove-type steadiness tester; NHST, nine-hole steadiness tester.

tude per se, and in this sense is unable to distinguish between tremor and other movement disorders (for example, chorea, dystonia) which could also impact on motor steadiness. Therefore, we are not suggesting that this instrument should be used as a diagnostic tool. Rather, because we have demonstrated that the modified Klove-Matthews Motor Steadiness Battery is correlated significantly with clinical ratings of tremor severity and tremor amplitude measured by quantitative computerized tremor analysis, the test is a valid index of tremor severity. As an easily transportable device, such a test could be incorporated into field studies to provide additional quantitative information to supplement clinical ratings.

In addition to data on patients with ET, we collected data on normal control subjects who had been stratified by age. These reference values may be useful for future studies using the modified Klove-Matthews Motor Steadiness Battery in terms of documenting the expected ranges for normal tremor and for ET.

There are several caveats. Our goal was to assess the use of this test battery for epidemiologic field studies in which subjects are not typically asked to alter their behaviors or to refrain from their usual daily activities. Our subjects were not asked to refrain from caffeinated beverages, alcohol, or smoking on the day of testing. Despite this, the use of these substances was limited, and there was no difference between cases and control subjects in terms of their use. Second, whereas our goal was to present reference values for future studies using the modified Klove-Matthews Motor Steadiness Battery, in some of the age strata sample, size was small and these values may not encompass the full range of variability in a larger sample. Third, the correlations between the modified Klove-Matthews Motor Steadiness Battery scores and other measures of tremor severity were more robust for the entire group than for patients with ET alone. This may have been a function of a more restricted range of tremor severity in the case-only analyses as well as the smaller sample size in these analyses. Despite this, the modified Klove-Matthews Motor Steadiness Battery scores were correlated significantly with several measures of tremor severity in the case-only analyses. Finally, although we assessed test–retest reliability, we did not assess interrater reliability.

In summary, the modified Klove-Matthews Motor Steadiness Battery provides a reliable and valid means to collect objective quantitative data on tremor severity. Its rapidity of administration, ease of transport, and simplicity make it a potentially useful tool for assessing tremor in epidemiologic and genetic studies that necessitate subject evaluations outside of medical centers.

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APPENDIX

Tremor Disability Questionnaire

The subject is asked three questions:

1. Do you have difficulty or disability?
2. If no difficulty, then do you need to modify the way you perform this task?
3. If no difficulty, then have you experienced a loss of efficiency when performing this task?
   1. Signing your name
   2. Writing a letter, postcard, thank you card, or check
   3. Typing
   4. Placing a letter in an envelope
   5. Drinking from a glass
   6. Pouring milk or juice from a bottle
   7. Carrying a cup of coffee
   8. Using a spoon to drink soup
   9. Carrying a tray of food
   10. Eating in a restaurant
   11. Inserting a coin in a pay telephone or a washing machine
   12. Dialing a telephone
   13. Holding a telephone to your ear
   14. Buttoning your buttons
   15. Tying your shoelaces
   16. Zipping up a zipper
   17. Putting on your eyeglasses
   18. Putting in your contact lenses
   19. Using eye drops
   20. Cutting, trimming, or filing your nails
   21. Putting on your watch
   22. Brushing your teeth
   23. Replacing a dollar bill in your wallet or purse
   24. Reading a book, magazine, or newspaper
   25. Unlocking door with a key
   26. Threading a needle
   27. Using a screwdriver
   28. Screwing in a light bulb
   29. Placing a plug in an electrical socket
   30. Tying your necktie (men) or putting on your lipstick (women)
   31. Shaving (men) or putting on your eyeliner (women)