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Primary Writing Tremor Type B, Writing Posture-specific?

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- Abstract -

Purpose : Primary writing tremor(PWT) can be classified as either type A or type B depending on whether tremor appeared during writing or whilst writing and also on adopting the hand postures normally used for writing. Through the clinical experience author has had an impression that PWT type B may not be purely dependant on specific writing postures. The objective of this study was to clarify whether PWT type B have writing posture-specificity or not. **Results :** The data indicated that type B PWT is not writing posture-specific. Various pronation and supination postures could evoke tremor as well as writing postures. Furthermore most of other pronation- and supination-related tasks could evoke tremors as well as action of writing. **Conclusions :** The present data suggest that PWT should be limited only on the pure form of task-specific PWT type A.

Key Words : Primary writing tremor, Classification, Pronation, Supination

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Rothwell¹ (廻轉儀, gyroscope) Motus I(Bioengineering)

Klawans⁵ 6 Motus Angular Rate Sensor

Sensor bandwidth DC 30 Hz

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5 B 6 (angular rate) MOTUS I RMS(Root Mean Squared) fast Fourier transforms

, 2) , 3) RMS 가 2 deg/sec plotted angular velocity strip chart 2 deg/sec

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36.5±9.4 , 4.7±2.0 (Table 1). 46.2±6.7 / (95% 50 , 60.75±4.61)

Table 1. Clinical characteristics of 6 patients of primary writing tremor type B.

| Patients | Sex | Handedness | Age at study(years) | Age at tremor onset(years) | Duration of tremor(years) |
|----------|-----|------------|---------------------|----------------------------|---------------------------|
| 1 | M | right | 39 | 34 | 6 |
| 2 | M | left | 28 | 24 | 4 |
| 3 | M | right | 43 | 39 | 3 |
| 4 | M | right | 52 | 49 | 3 |
| 5 | M | right | 48 | 44 | 4 |
| 6 | M | right | 37 | 29 | 8 |

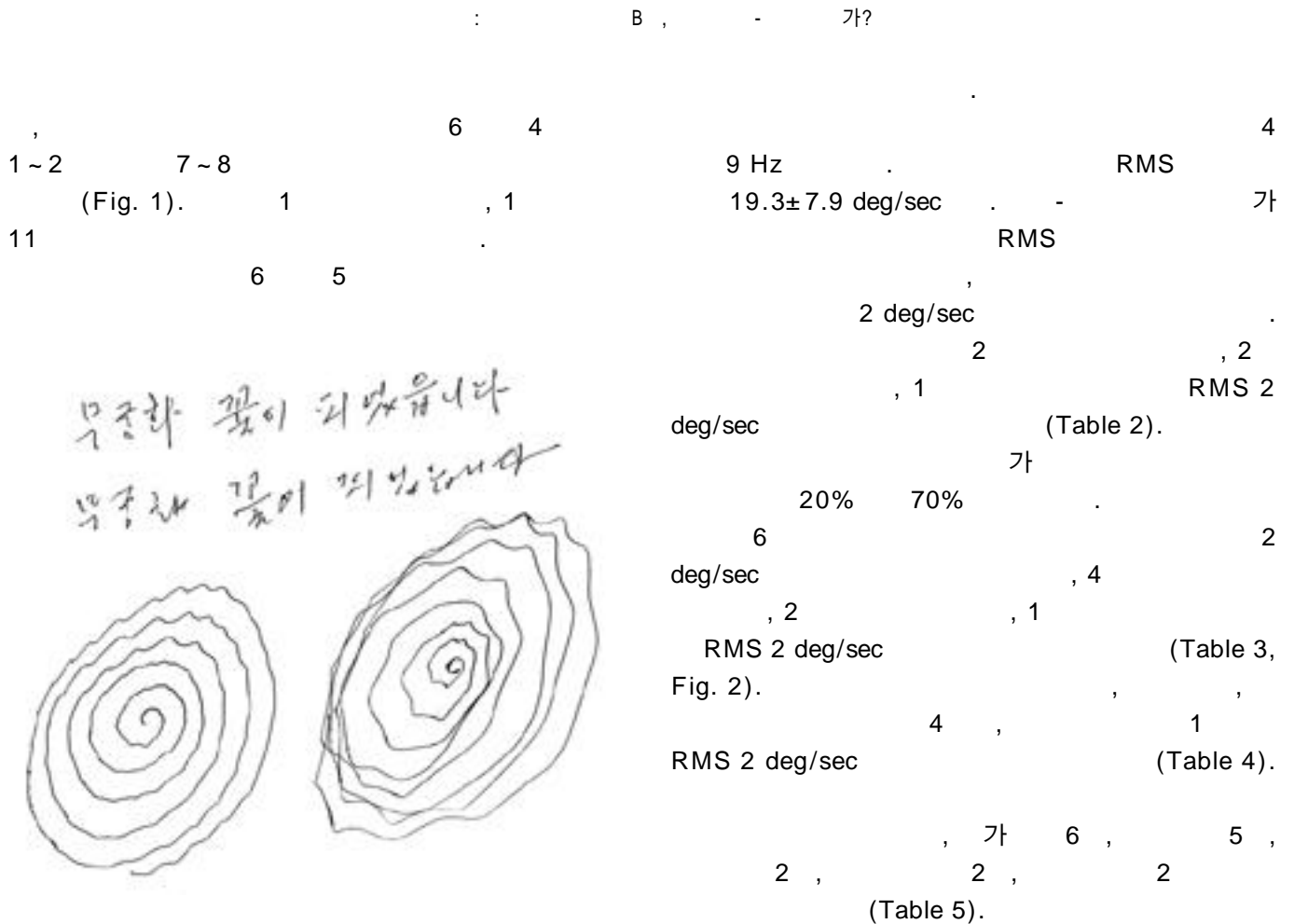


Figure 1. Writing and drawing samples in primary writing tremor type B(case 3). Tremors were prominent during writing as well as on adopting writing postures. Up: Slow writing, Middle: Fast writing, Bottom: slow drawing of Archimedes spirals(left) & fast drawing of Archimedes spirals(right).

Table 2. Angular rate RMS(Root Mean Squared) of tremor in various postures with no muscle contraction. Angular rate RMS of tremor were obtained by an gyroscope sensor which was attached to the dorsum of the dexterous hand of each patient. Bold styles indicate above 2 deg/sec angular rate RMS of tremor frequency components.

| | Supination | Semisupination | Neutral position | Semipronation | Pronation |
|--------|------------|----------------|------------------|---------------|-----------|
| Case 1 | 1.14 | 1.20 | 1.24 | 17.25 | 1.34 |
| Case 2 | 1.28 | 1.49 | 1.36 | 1.34 | 1.34 |
| Case 3 | 1.36 | 28.34 | 32.60 | 9.81 | 1.18 |
| Case 4 | 1.36 | 1.22 | 1.32 | 1.41 | 1.32 |
| Case 5 | 1.38 | 1.26 | 1.23 | 1.23 | 1.41 |
| Case 6 | 0.68 | 45.97 | 0.39 | 0.52 | 0.21 |

Table 3. Angular rate RMS of tremor in various postures with minimal muscle contraction. Angular rate RMS of tremor were obtained as the same methods with no muscle contraction states. Bold styles indicate above 2 deg/sec angular rate RMS of tremor frequency components.

| | Supination | Semisupination | Neutral position | Semipronation | Pronation |
|--------|-------------|----------------|------------------|---------------|--------------|
| Case 1 | 1.51 | 1.26 | 4.74 | 26.46 | 1.35 |
| Case 2 | 1.36 | 1.34 | 7.39 | 14.33 | 1.38 |
| Case 3 | 1.30 | 26.89 | 31.02 | 28.81 | 1.27 |
| Case 4 | 2.80 | 2.68 | 3.54 | 3.28 | 1.60 |
| Case 5 | 1.69 | 6.49 | 5.69 | 6.22 | 4.17 |
| Case 6 | 1.54 | 41.52 | 63.44 | 38.65 | 21.96 |

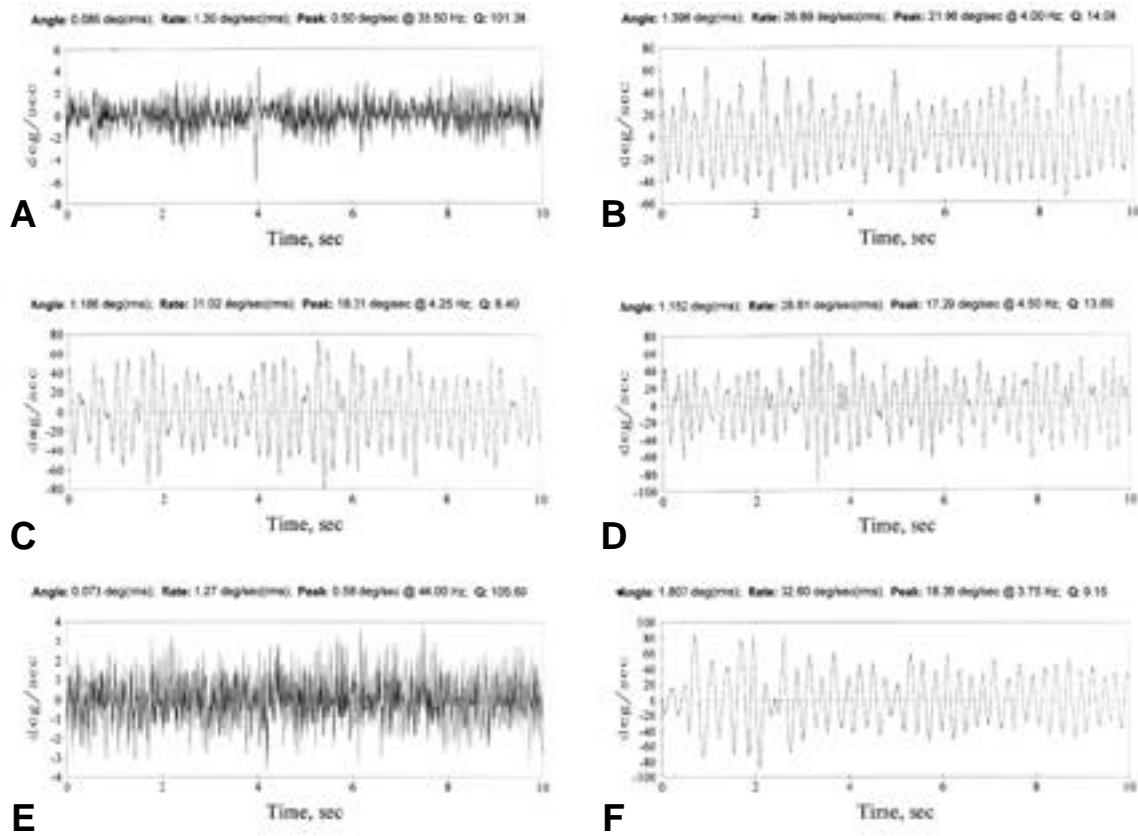


Figure 2. The angular rate strip charts(case 3) in various pronation-supination postures with minimal muscle contraction and during writing. The angular rate strip chart measures angular velocity in degree/second on the vertical axis, and angular rate time in seconds along the horizontal axis. The minimal muscle contraction intensity of this case was 50% of that of maximal contraction. (A) complete supination posture, (B) semisupination posture, (C) Neutral posture, (D) semipronation posture, (E) complete pronation posture, (F) Writing.

Table 4. Angular rate RMS of tremor in various postures with maximal muscle contraction. Angular rate RMS of tremor were obtained as the same methods with no muscle contraction states. Bold styles indicate above 2 deg/sec angular rate RMS of tremor frequency components.

| | Supination | Semisupination | Neutral position | Semipronation | Pronation |
|--------|------------|----------------|------------------|---------------|-------------|
| Case 1 | 1.34 | 1.27 | 1.42 | 20.34 | 1.35 |
| Case 2 | 1.01 | 1.69 | 6.30 | 5.65 | 1.45 |
| Case 3 | 1.40 | 9.14 | 8.89 | 1.28 | 1.23 |
| Case 4 | 1.90 | 2.14 | 1.42 | 1.63 | 1.49 |
| Case 5 | 1.69 | 5.33 | 5.67 | 3.42 | 1.45 |
| Case 6 | 1.56 | 3.48 | 5.48 | 9.47 | 2.71 |

Table 5. The appearance of tremors in various ordinary fine tasks which are related to supination and pronation postures. Rating of tremor severities in various other tasks were based on the individual's writing tremor severity(++).

| | writing | brushing | spooning | shaving | combing | holding a cup |
|--------|---------|----------|----------|---------|---------|---------------|
| Case 1 | ++ | | + | + | + | |
| Case 2 | ++ | | + | + | | |
| Case 3 | ++ | + | ++ | ++ | + | |
| Case 4 | ++ | | + | | | |
| Case 5 | ++ | | + | + | | + |
| Case 6 | ++ | + | +++ | + | | |

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