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Semmes Weinstein sensory testing at the fingertip: Should 2.83 be the norm?

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Background

The Semmes-Weinstein monofilament test (SWM) is an objective test of sensation that is commonly used to identify sensory impairments in the hand. In traditional SWM testing, one out of three positive responses to the 2.83g monofilament indicates “normal” sensation, while a positive response to only the 3.61g monofilament indicates “diminished” sensation.¹ Studies have found a significant variability in sensibility across subjects, which questions the validity of the 2.83 monofilament as normal.^{2,3}

Objective

To determine if male and female subjects with no history of sensory symptoms or known neurologic conditions would feel the 2.83 (normal) Semmes-Weinstein monofilament and to compare grip strength of subjects with “normal” sensation and “diminished” sensation.

Methods

95 subjects ≥ 25 years of age (34 men, 61 women) were recruited for the study. Informed consent, a medical screen and activity history were obtained prior to testing.

Subjects were seated in a quiet room with a screen placed between them and the examiner. All subjects received the exact same instructions, and the monofilaments were applied in the same order:

- ❖ The 2.83 monofilament was applied to the tip of the fingers in the following order for each hand:
 - ❖ Left hand: ring finger, followed by the thumb, middle, small and index
 - ❖ Right hand: ring finger, followed by the thumb, middle, small and index.
- ❖ Following application of the 2.83 at each fingertip, the 3.61 monofilament was applied in the same order, mentioned above, for each hand.
- ❖ The order of the 2.83 monofilament was repeated, followed by the 3.61 monofilament, three times.
- ❖ Positive responses were recorded.

The Jamar Dynamometer was used to measure grip strength. The average of three trials was recorded.

Data analysis: A t-test was used to compare the grip strength of subjects dichotomized into two groups: the 2.83 “normal” (ability to detect the 2.83 monofilament in three or more digits) and the 3.61 “diminished sensation” group (ability to detect the 3.61 monofilament in three or more digits).

Results

Dichotomized Groups Based on 2 out of 3 Positive Responses

N=95 Participants (950 digits) completed the evaluations. Using 2/3 positive responses, 31.5% were dichotomized into the “normal group” (able to detect the 2.83 monofilament in more than 3 digits). 68.5% were dichotomized into the “diminished light touch” group (able to detect 3.61 monofilament).

Traditional SWM: Based on 1 out of 3 Touches with 2.83

N=95 Participants (950 digits) completed the evaluations. 44.6% were able to detect the 2.83 in 3 or more digits at least once while 55.4% did not but were able to detect the 3.61 in 3 or more digits at least once.

Limitations

- ❖ Test-retest reliability was calculated initially, but continued periodic checks were not performed. However, standardized language and administration procedures were followed.
- ❖ Research has shown that the monofilaments may be affected by repeated use;⁴ however, to improve reliability the same monofilaments were used.
- ❖ Unequal distribution of age: 18% > 50 [range 53-71]; 82% < 50 [range 25-49]
- ❖ Unequal distribution of men: women [34 men; 61 women]

Conclusions

- ❖ The 2.83 monofilament could not be detected at the fingertips by greater than 49% of participants on the left hand and greater than 60% of participants on the right hand when using the standard SWM method of one positive response out of three attempts.
- ❖ To decrease the risk of false positives or guessing, two out of three responses to the 2.83 monofilament reduced the amount of participants who could feel the 2.83 (normal) monofilament to 31% on the left hand and 26% on the right hand.
- ❖ The inability of subjects to feel the 2.83 may indicate the need for further refinement of the Semmes-Weinstein monofilament test and further investigation into the redefinition of the norms.
- ❖ Grip strength was statistically higher in the 3.61 groups compared to the 2.83 groups; however, the difference was not significant in the right hand of the 1/3 touch group.
- ❖ Because participants who did not feel the 2.83 monofilament had statistically significant higher grip strength, occult neuropathy would not likely explain these findings.
- ❖ Further investigation is needed with a larger sample size and the assessment of characteristics such as vibration and pressure.

References

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