

Stiffness Discrimination Characteristics of Elastic Materials in Qualified Acupuncturists

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Abstract— This study aimed to examine stiffness discrimination characteristics of elastic materials in qualified acupuncturists for establishing an objective evaluation method for palpation skills. As a result, it was confirmed that the discrimination rate for elastic materials in a certain range of hardness tended to be low.

I. INTRODUCTION

In the palpation of qualified acupuncturists, the stiffness that is harder than the surrounding area is detected through the palpation movement. However, palpation depends on experience and intuition, and the evaluation of palpation skills is subjective and ambiguous. Therefore, there is a need to establish an objective evaluation method for palpation skills in the field of education. This study aimed to examine stiffness discrimination characteristics of elastic materials in qualified acupuncturists for establishing an objective evaluation method for palpation skills.

II. METHODS

In this study, a stiffness discrimination evaluation experiment was conducted on qualified acupuncturists. The participants were 7 qualified acupuncturists (mean age 43.4 ± 6.4 years). For the stimuli to be presented, eight types (from A to H) of elastic materials with slightly different stiffness were prepared as test pieces, referring to previous studies [1] (Table 1). Six test pieces from B to G were used as standard stimuli, and two adjacent test pieces from each category were used as comparison stimuli. Combinations of the same test piece were also included in the trials. There were 13 combinations of the alphabet, and 4 trials were conducted for each condition. For example, for the combination of test pieces A and B, two trials were conducted in the order of A-B and two trials in the order of B-A. In addition, the condition in which the same test piece was presented, such as B-B, was conducted for four trials each. The participants pressed the two test pieces in turn with their fingertips and answered the alphabet of the test piece they felt was harder or the same stiffness.

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Table 1 Test pieces in this experiment

Test pieces	Young's Modulus (log) [N/m ²]	Categories
A	3.79	extremely soft
B	4.16	fairly soft
C	4.33	slightly soft
D	4.50	neither
E	4.68	slightly hard
F	4.89	slightly hard
G	5.26	fairly hard
H	5.55	extremely hard

III. RESULTS AND DISCUSSION

The percentages of correct responses were 91.7%, 91.7%, 60.0%, 75.0%, 90.0%, and 81.7%, respectively, for the conditions in which test pieces B through G were used as standard stimuli. It can be seen that the percentage of correct responses tended to be lower in the conditions where test pieces D and E were used as standard stimuli. The Young's moduli of test pieces D and E are 4.50 and 4.68, which are close to those of human subcutaneous tissue [2]. The Young's modulus of test pieces D and E was 4.50 and 4.68, which is close to that of human subcutaneous tissue. This suggests that it may be difficult for qualified personnel with a lot of tactile experience to discriminate the stiffness of an object when it is as hard as the subcutaneous tissue of a finger.

IV. CONCLUSION

This study aimed to examine stiffness discrimination characteristics of elastic materials in qualified acupuncturists for establishing an objective evaluation method for palpation skills. As a result, it was confirmed that the discrimination rate for elastic materials in a certain range of hardness tended to be low.

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