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Hand-Held Dynamometer used the examination of the Maximum Knee Extension Muscle assessment by 1 person with iPad

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Introduction

Manual Muscle Test (MMT) enables physical therapists to assess muscle seems to general the clinical physical therapy but MMT does not interpret muscle over grade 4 because of measures proceeding from subjective judgment. For this rea-son, the general theory describe that Manual Muscle Test take Muscle Measure machinery together. [1,2] The Muscle Measure machinery name is Torque machine, Biodex, Cybex and Hand-Held Dynamometer (HHD). These are high numbers of reliability because machines could firmly fix body on the seat, but these are so expensive and needed a large place, therefore HHD to compensate the disad-vantage of Torque machine, Biodex and Cybex. [3]
The prior research mention Knee extension muscle relate to standing motion and walking ability, hence the physical therapist needs a measure to be a representa-tive of quadriceps muscles.[4,5] Furthermore, this theory is measured as a repre-sentative muscle test of the lower extremities and it has been reported that the va-lidity of an isometric knee extension muscle it is used by the fixed belt.[6,7] In addi-tion, eyes feedback affects measurement motion from iPad movie.[8]
From the above, the main objective of this paper is to examine the validity of an isometric knee extension muscle in which one person uses HHD and iPad. Be-cause of normally HHD measured is done by two examiners, but clinical physical therapy is a shortage of human resource that is difficult to measure with multiple people.

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Methods

The study cohort comprised 19 healthy adults. 9 men, 10 women at an average aged of 34.1± 7.9 years, an average height of 163.0 ± 5.3 cm, an average weight of 55.7 ± 7.0 kg and an average length of lower limb 39.3 ± 2.3 cm. This research was not conducted even if tester had in case of injuries such as the pain of the leg or the lumbar vertebrae, a medical history of the measured cerebrovascular disorder, knee joint and thigh of the lower extremity. The measurement was done after obtaining informed consent.

The Measure machinery was HHD that has been used for this research (Figure1, Mobie MT-100, Medical of Sakai). The study performed an examination of maximum isometric knee extension muscle under two conditions. The measure was of the right leg because of it was one dominate foot. [9], [10] Measurement 1 performed by Two examiners. Examiner fixed the pelvis and suppressed compensation. The other examiner performed measurement 1 that was used to confirm trunk and hip motion by iPad movie（Sagittal plane）during measure. Measurement 2 was taken a movie by using an iPad. (DMPLQFYAFK12 Apple). When conducted measurement 1 and measurement 2, the days of measurement was changed, and the time measurement was the coordinated. Measurement 1 was done by a male physiotherapist (3 years of experience, examiner A) and female physiotherapist (1 year of experience, examiner B). Measurement 2 was done by examiner A alone.

The measurements were done in these conditions: seating, holding the trunk vertical, stiff pelvis and hands that to hold a bet. In addition, a non-measuring foot was installed on the platform. The Measurement under belt attached sensor pad measures 1/3 of the lower leg at the center (30% of the lower leg length), (Figure 2). Furthermore, the maximum contraction completed 3 seconds including 5 seconds and a rest time of 30 seconds was set for each performance. Before measurement, orientation about the measurement method was carried out with an iPad movie (Figure 3).

The present study was approved by the Ethics Review Committee of the Hamamatsu Medical Center (Number 4, 2017).

Results

Statistical analysis conducted at the T-test after the test of normality. Furthermore, we invested inter-rater reliability of two types of methods by the Intraclass correlation coefficient. Both of that was level of significance was set at less than a 5 % risk rate ($p < 0.05$). Imai showed an average of ICC was possible over 0.6, OK over 0.7, Good over 0.8 and Great over 0.9.[11]

On the basis of the 2 measurements, the maximum value was adopted N・feet length and weight-ratio muscle strength (Nm / kg) corrected by body weight which was compared and examined. Maximum isometric knee muscle force of weight ratio muscle force value in 2 conditions was average significantly at measurement 1 was 1.73 ± 0.38 Nm / kg, measurement 2 was 1.57 ± 0.46 Nm/kg, (Figure 4）. The number was shown that measurement 1 was higher than measurement 2. Inter-rater reliability showed that ICC was 0.639 (Figure 5). However, this research excepted to admit clearly compensatory motion 5persons after measurement.

Discussion

This theory compared measurement 1 and measurement 2 by reason of measurement 2 the validity of an isometric knee extension muscle that one person was using with HHD and iPad. Because consideration was taken due to the shortage of human resource in clinical place. We couldn’t admit that a significant difference was not recognized between measurements 1 and 2. Furthermore, Inter-rater reliability was 0.639 in a range of possibilities. From the above, normally HHD measured was done by two examiners, but we had become clear about one examiner hold on Inter-rater reliability.

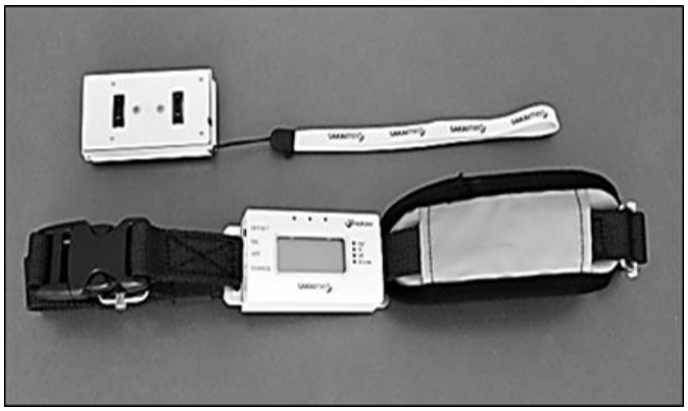

Figure1 HHD（Mobie MT-100，Medical of Sakai）

Figure2 Clamped condition. A, Frontal plane; B, Sagittal plane (Movie by sagittal plane)

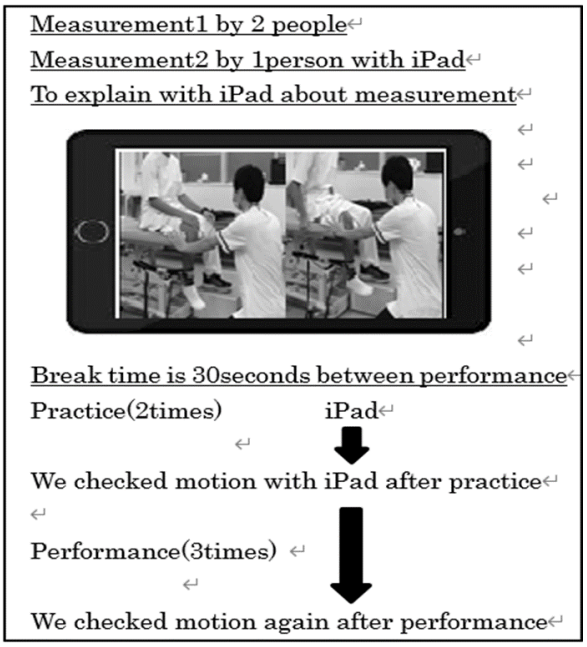

Figure 3 Protocol

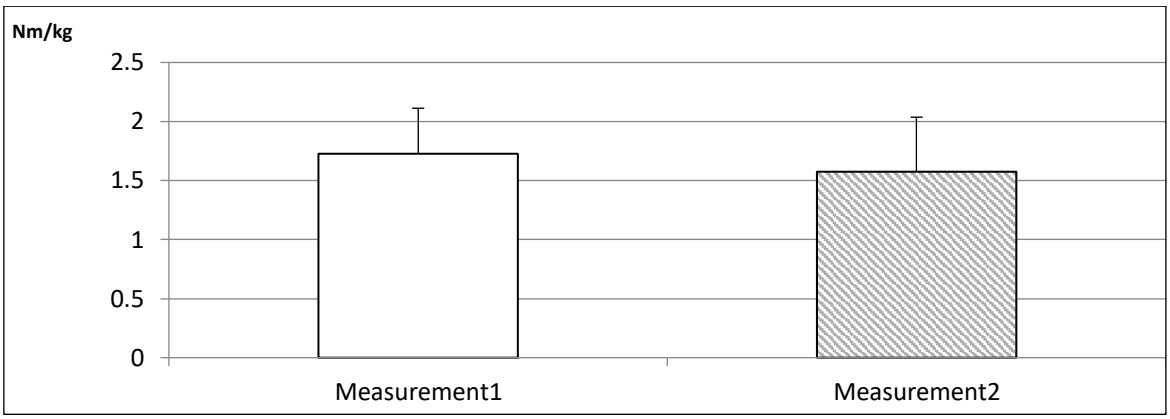

Figure 4 Number mean extension muscle.

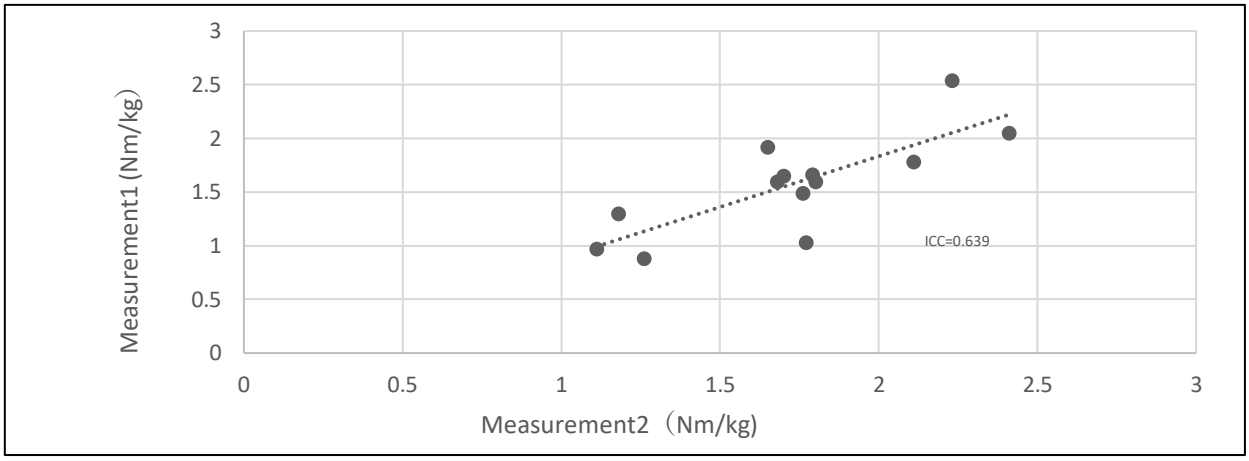

Figure 5 Inter-rater reliability

One reason for Inter-rater reliability that we seemed to work the movement restraint to compensation movement by using feedback from the eye. The paper expected that voluntary control was suppressed due to self-conscious actions because of iPad movie for an explanation of produce. From previous reports that in general, 87 % of information was received visually[12] that was why measurement 2 seems to develop self-consciousness and cognitive consciousness which arise from the visual information of the iPad movie. Actually, motor learning was one of the methods to improve motor skills including mirror neurons that it observed motions.[13] However, this research couldn't compare using movie and no movie, hence we had to continue to consider this method with NIRS (Near-Infrared Spectroscopy). Furthermore, results were shown that measurement 2 was lower than measurement 1. We assumed that the measurement has the potential to about muscle strength has decreased because knee extension motion adds suppression of compensation movement.

Physiotherapists assumed that the measurement has the potential to about muscle strength has decreased and to admit the suppression of compensation movement during measurement, therefore firmly belt was necessary to hold body and suppression of compensation movement. We needed to further our method that was necessary to go up safety, efficient and accuracy.

Conclusion

This theory considers the validity of an isometric knee extension by one therapist because of the clinical place has a shortage of human resource. Because of we couldn't admit that a significant difference was not recognized between measurements 1 and 2. Furthermore, Inter-rater reliability was in a range of possibilities, hence

we had become clear about one examiner hold on Inter-rater reliability. However, suppression of compensation movement affects the measured value that differs measurement 1 and 2. Further consideration will be needed to yield any findings of measurement environment about the suppression of the compensation movements such as by one therapist.

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Conflict of Interest: All authors report no conflict of interest.

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