

## Introduction

The mechanism of pelvic floor muscles training is to improve the strength and timing of contraction of the pelvic floor muscles during abdominal pressure by strengthening the pelvic floor muscles. However, when the pelvic floor muscles are consciously trying to contract, they often fail to do so spontaneously, even in healthy individuals.

When training the pelvic floor muscles, it is recommended to avoid excessive contraction of surrounding muscles other than the pelvic floor muscles (abdominal muscles, hip adductor muscles, psoas muscles, etc.) during exercise and to begin training in the supine position with the pelvic organs unweighted.

At last year's conference, we reported that when the inclination angle from supine to standing varied from 0 to 70°, the pelvic floor muscle elevation was significantly greater at an inclination angle of 20°. Therefore, it was predicted that increasing the head-up angle, which involves flexion of the subject's hip joints and raising the upper body, might increase the amount of elevation of the pelvic floor muscles.

Therefore, the purpose of this study was to clarify whether the same change in the amount of elevation of the pelvic floor muscle group occurs in the head-up posture with hip flexion.

## Methods and Materials

- Thirty-two healthy women without orthopedic disease in the lumbar region, pelvic girdle area, or lower extremities who gave consent were included in the study. The mean and standard deviation of age, height, weight, and BMI of the subjects was 21.2 ± 0.9 years, 161.5 ± 6.0 cm, 53.6 ± 6.7 kg, and 20.5 ± 1.9 kg/m2.
- An ultrasound system (SONIMAGE MX1 Konica Minolta) was used to measure pelvic floor elevation (length of pelvic floor moved headward from rest), using a 3.5 MHz convex-type probe.
- The subjects were asked to drink 500 mL of water 1h before the measurement to allow the bladder to fill with urine. The probe was placed on the suprapubic margin to measure the bladder floor and tilted 60 degrees cephalad. The depth was adjusted so that the entire bladder could be observed. After drawing a transverse section of the bladder and confirming the position of the pelvic floor muscles, measurements were taken three times per position, with 3 seconds of contraction and 10 seconds of relaxation as a set. We checked whether the pelvic floor muscles were correctly contracted by measuring the movement of the bladder floor toward the head when the pelvic floor muscles were voluntarily contracted. The length from the abdominal wall to the bladder floor was measured when the head-up angle was 0 °, 10 °, and 20 ° . The order of measurement positions was randomized.

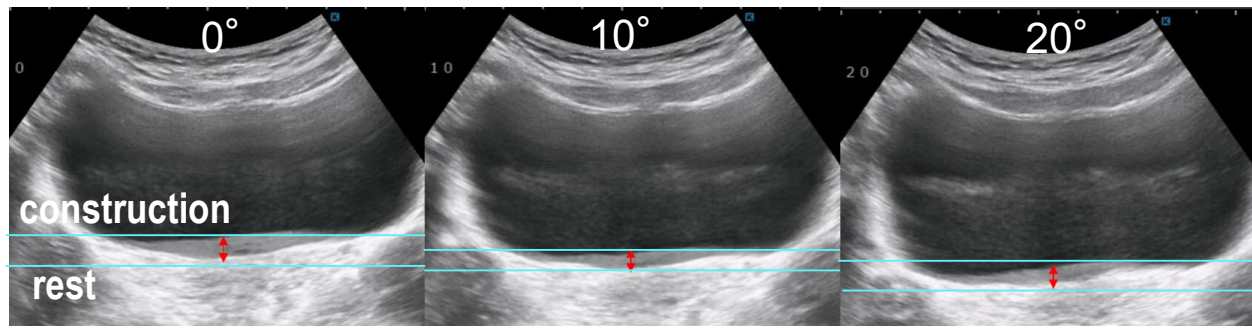
•Statistical analysis was performed using SPSS statics26.0 (IBM) with a significance level of 5%. One-way analysis of variance was used to compare pelvic floor elevation in the three limb positions. This study was conducted after approval by the Research Safety and Ethics Committee (Approval No. 21036).



Posutre during measurement (Head up position)  
Their upper body elevated to a 0–20-degree angle with hip flexion.

## Results

- The mean (standard deviation) pelvic floor elevation at 0° , 10°, and 20° head-up angles were 7.5 (5.9), 6.9 (5.8), and 7.8 (6.4) mm, respectively .
- There was no significant difference between the three groups (F (2,93) =0.217, p=0.806).



Ultrasound images of the bladder

The red arrows indicate the difference between voluntary contraction of pelvic floor muscles and at rest when the head-up angle was 0 °, 10 °, and 20 °

## Discussion

At last year's conference, we reported that when the tilt angle from the back lying to standing was changed from 0 to 70 °, the pelvic floor muscles' elevation was significantly greater at a 20 ° tilt. Therefore, in this study, we speculated that the amount of elevation of the pelvic floor muscles would be greater at the same 20-degree angle when changing the head-up angle with hip flexion. However, in the present measurements, the mean amount of elevation of the pelvic floor muscles did not change between the three angles.

When the pelvic girdle is tilted posteriorly, the pelvic floor is more easily loaded and the pelvic floor muscle groups are less active. Conversely, when the pelvic girdle is excessively anteriorly tilted and the abdominal muscle groups are weakly supported, abdominal pressure may be applied forward in the pelvic region.

Since the pelvic tilt angle affects the amount of elevation of the pelvic floor musculature, it can be inferred that changing the gap-up angle does not make a difference in the pelvic tilt angle relative to the spinal column, and thus does not make a difference in the contractile activity of the pelvic floor musculature.

## Conclusions

Although the upper body was moved by having the patient do head up, no consideration was given to the anterior, posterior, or intermediate position of the pelvic girdle.

It was thought that the contraction activity of the pelvic floor muscles may have differed due to the different positions of the pelvic girdle for each individual.

It is necessary to measure the activity of the pelvic floor muscles at positions that take into account the relationship between the spinal column and pelvic girdle, not just the angle of the upper body.