Relationships Between Lumbar Lordosis, Pelvic Tilt, and Abdominal Muscle Performance

Research Seminar
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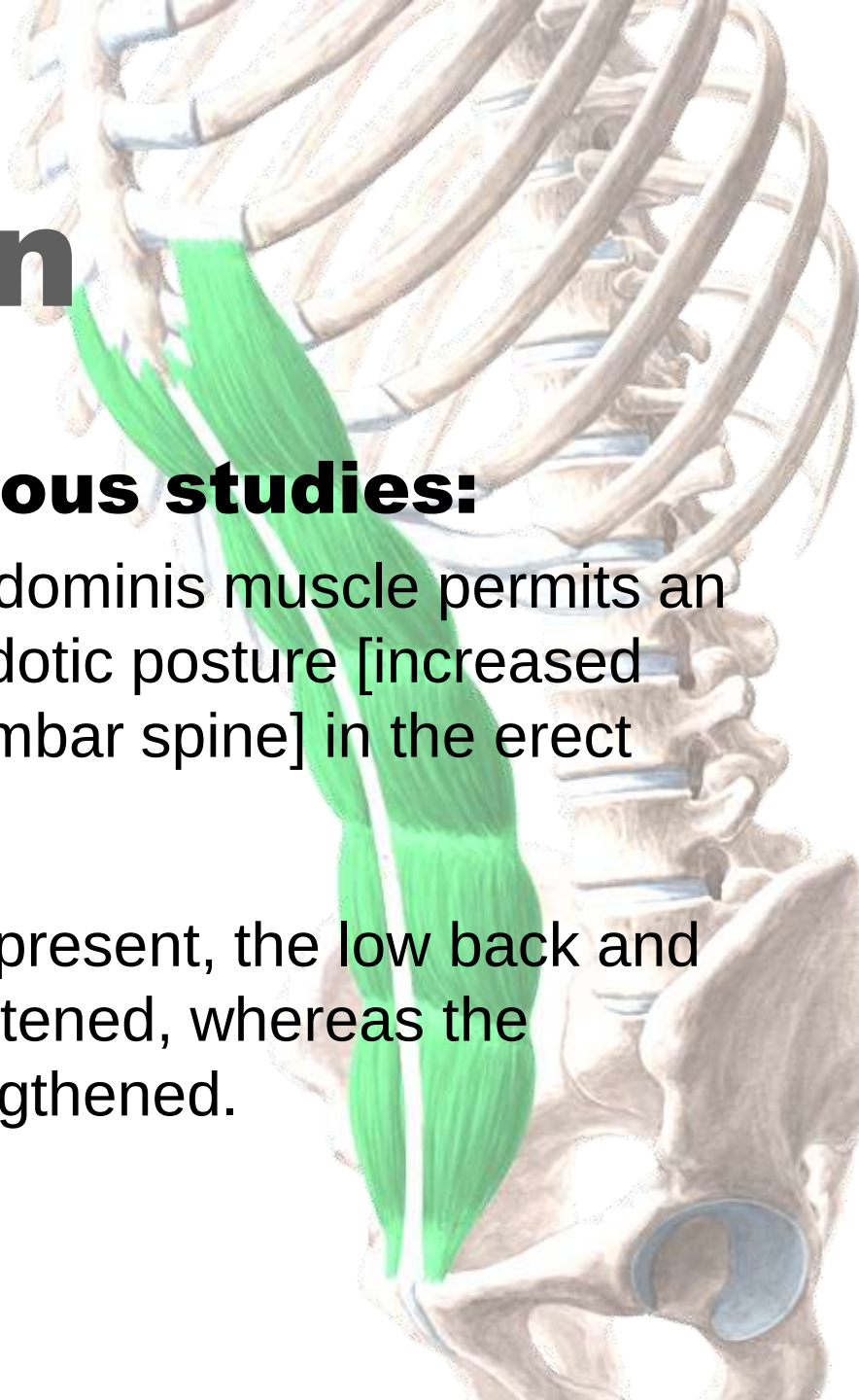
Introduction

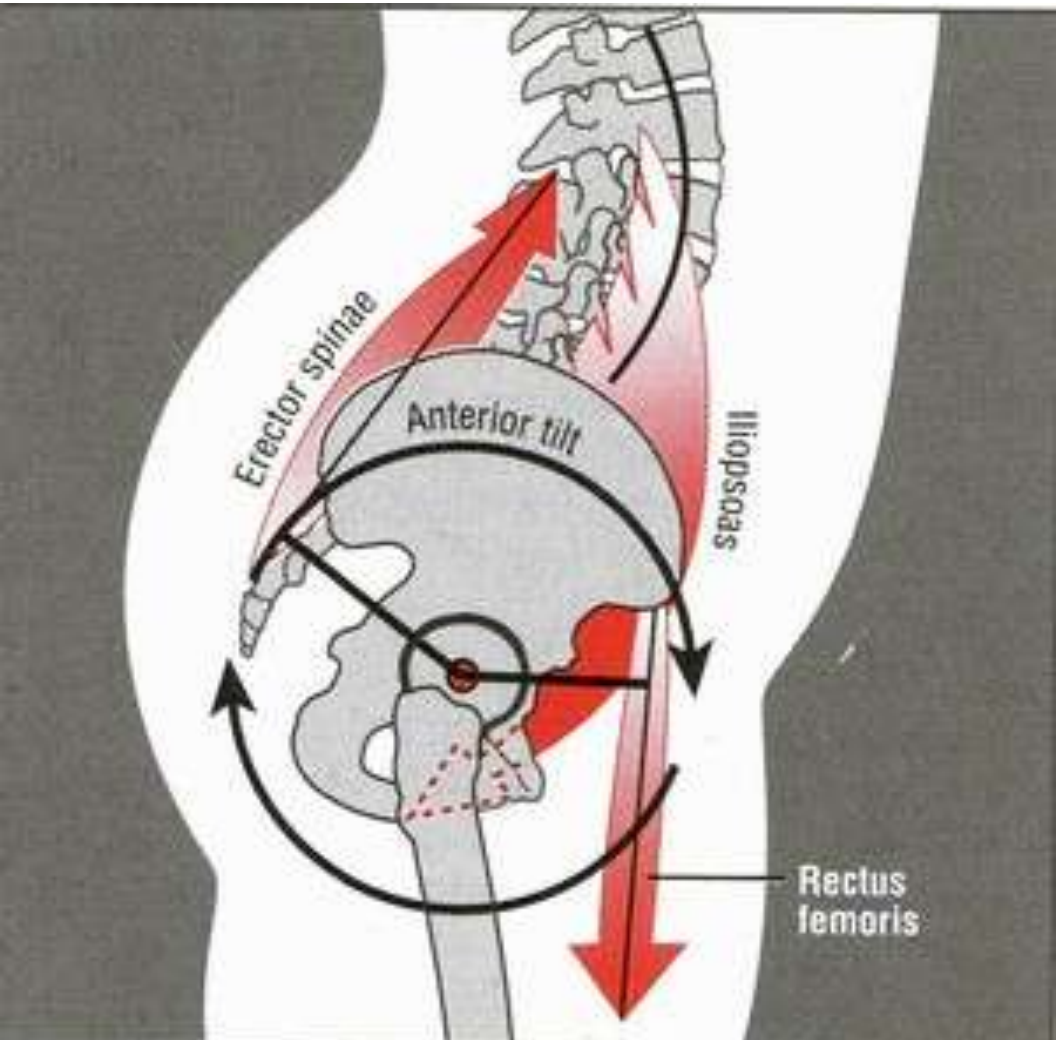


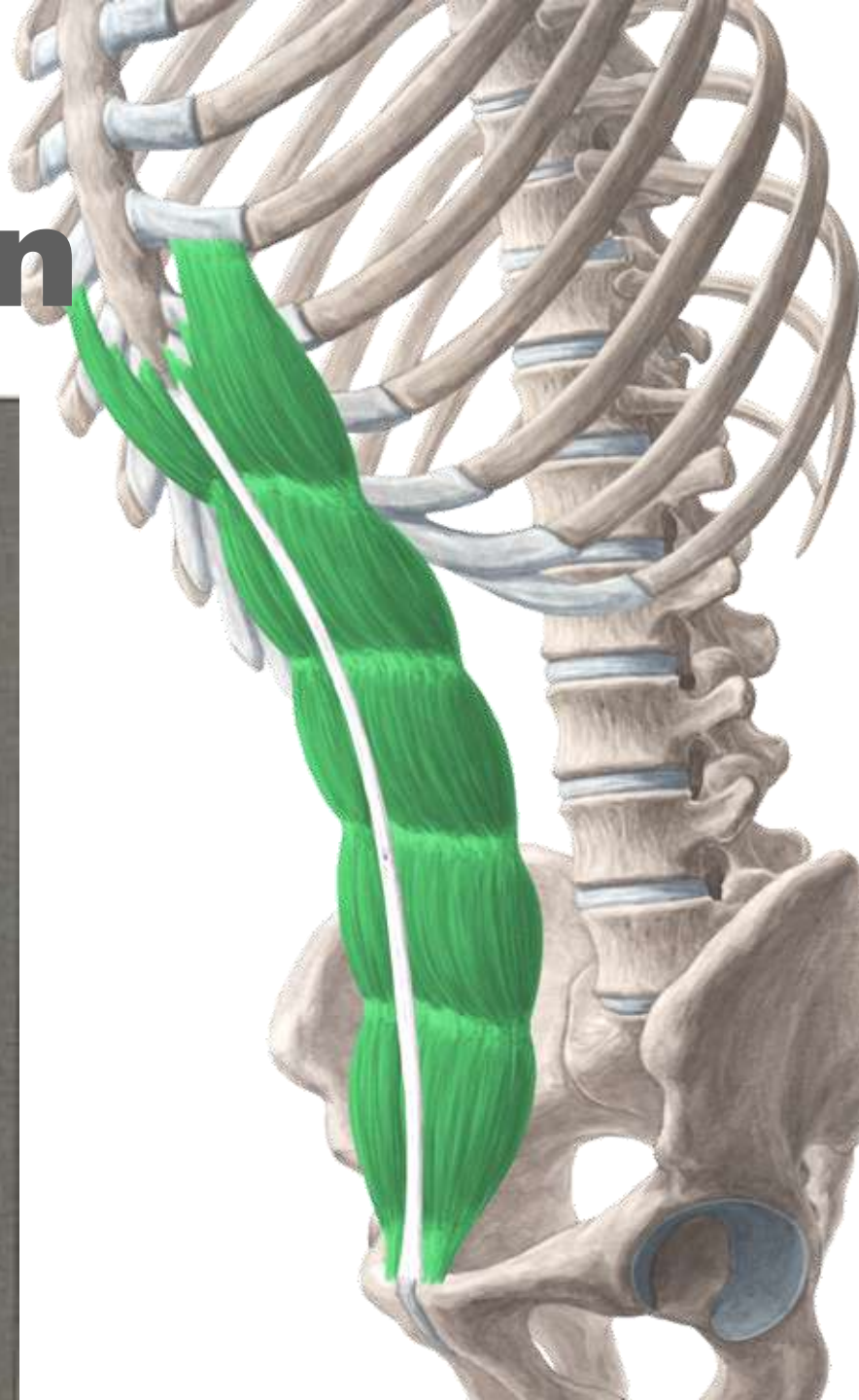
Hypotheses from previous studies:

- Weakness of the rectus abdominis muscle permits an anterior pelvic tilt and a lordotic posture [increased anterior convexity of the lumbar spine] in the erect position.

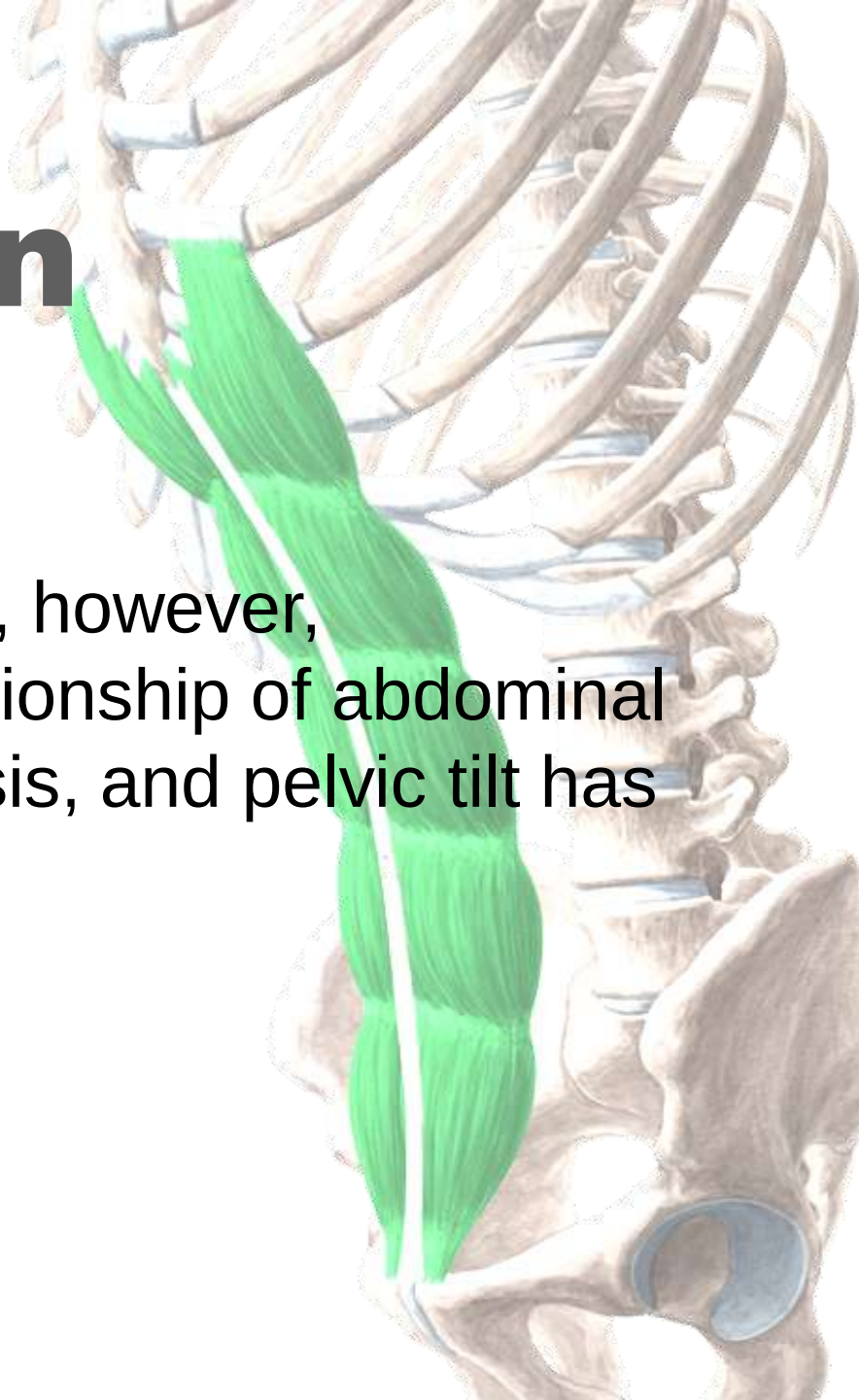
- When a lordotic posture is present, the low back and hip flexor muscles are shortened, whereas the abdominal muscles are lengthened.

Introduction





Introduction



Walker et al.:

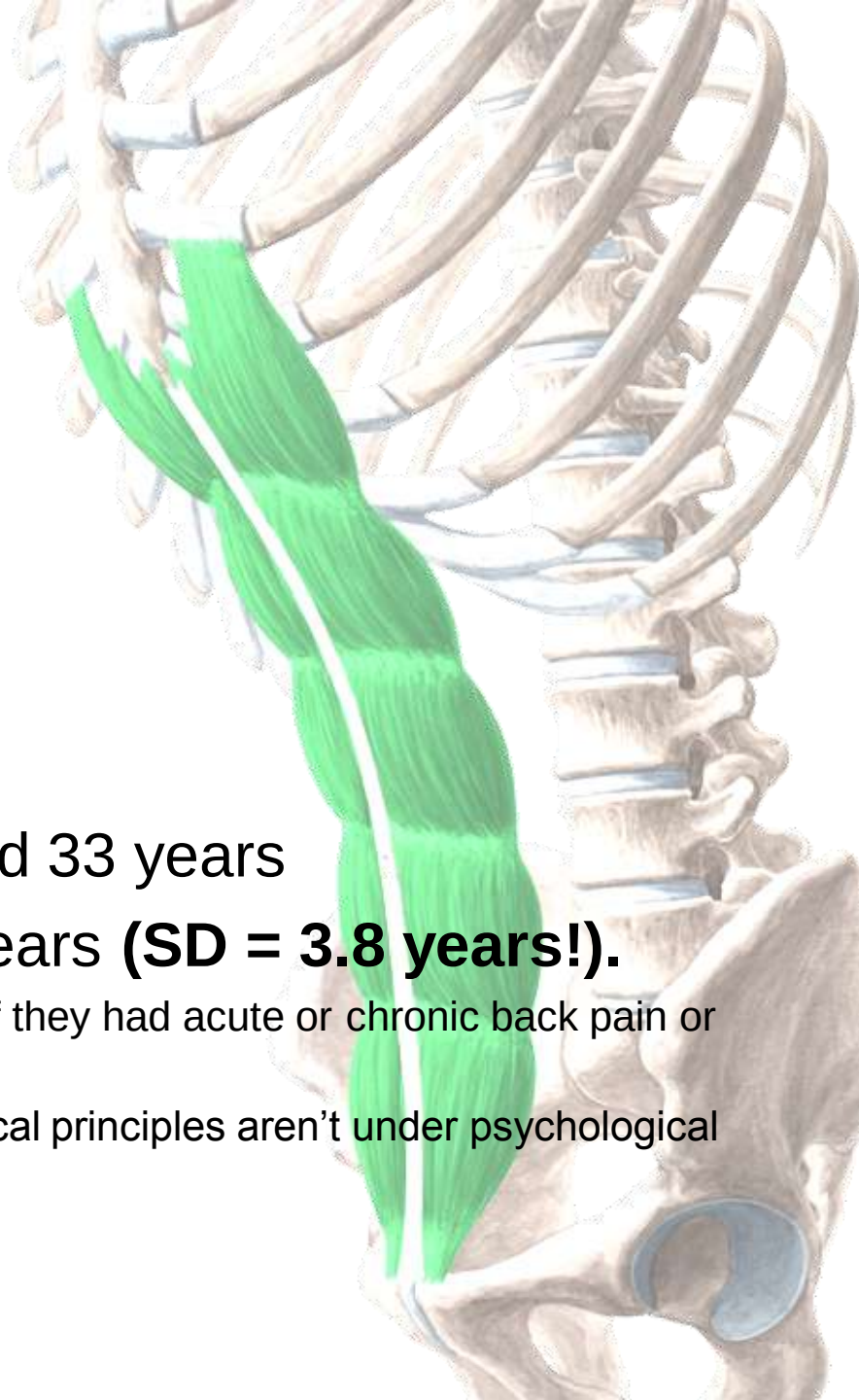
- Experimental evidence, however, demonstrating the relationship of abdominal muscle strength, lordosis, and pelvic tilt has not been published.

Introduction

Purpose of study:

- To correlate abdominal muscle function, lumbar lordosis, and pelvic tilt in healthy subjects.

Method



Subjects:

- 31 healthy students
- 23 women
- 8 men
- Between the ages of 20 and 33 years
- With a mean age of 23.9 years **(SD = 3.8 years!).**
- Subjects were excluded from the study if they had acute or chronic back pain or a scoliosis of greater than 15 degrees.
- No control group necessary as mechanical principles aren't under psychological control.

Method

Equipment:

- **Lumbar lordosis** was measured with a flexible curve that was molded to the contour of the lower back.

Method

Equipment:

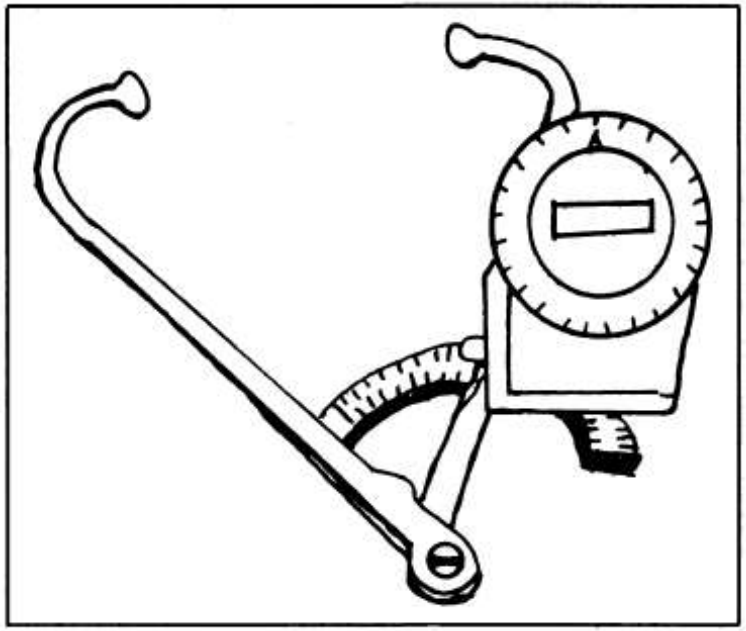
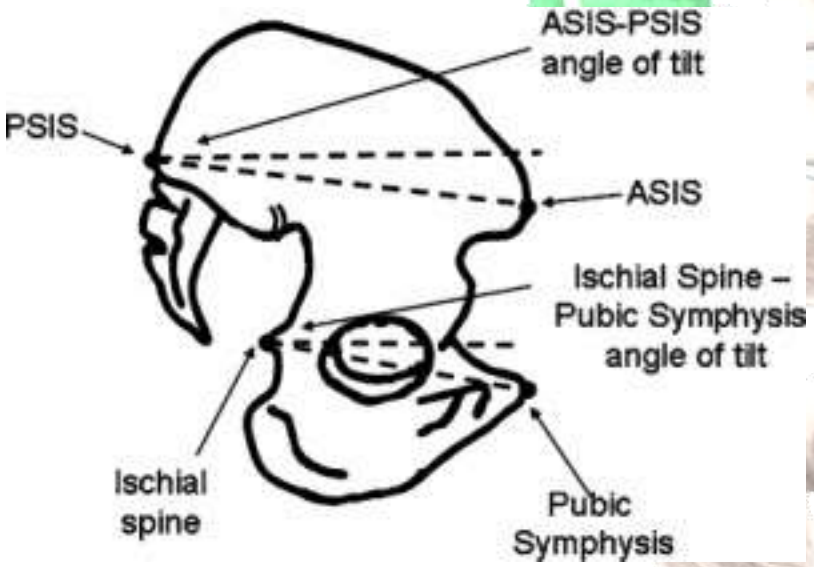


Fig. 1. Inclinometer consisting of a caliper with two arms that can be placed over the subject's anterior superior and posterior superior iliac spines so that the angle of pelvic tilt can be read from gauge.

– **Pelvic inclination** was measured using an inclinometer to determine the angle formed with a horizontal line drawn between the anterior superior iliac spine (ASIS) and the posterior superior iliac spine (PSIS).



Method

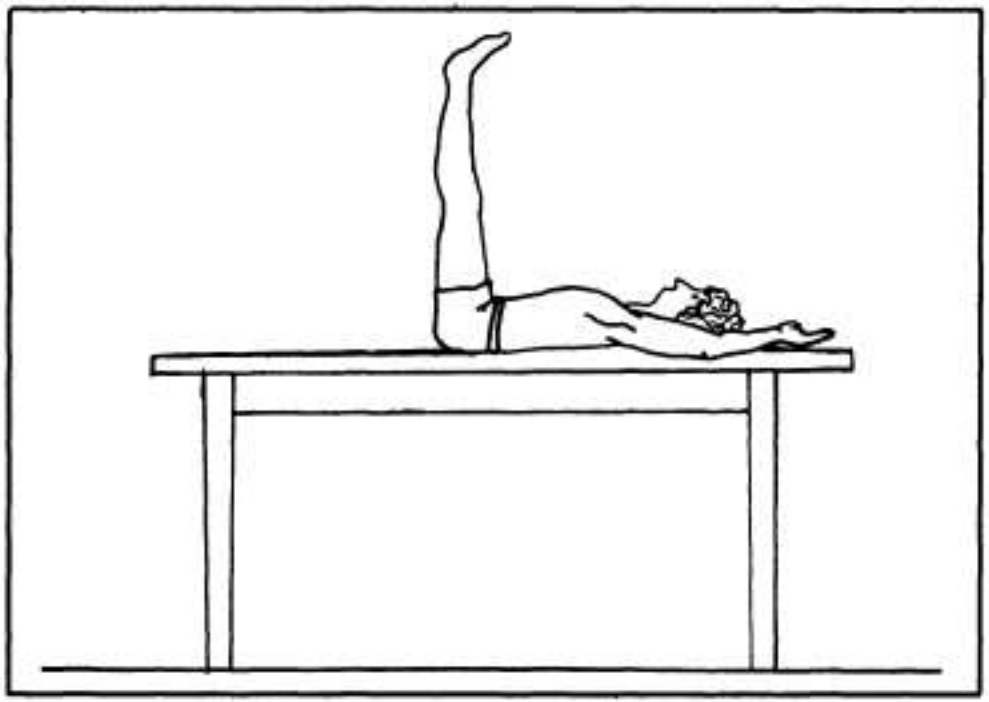
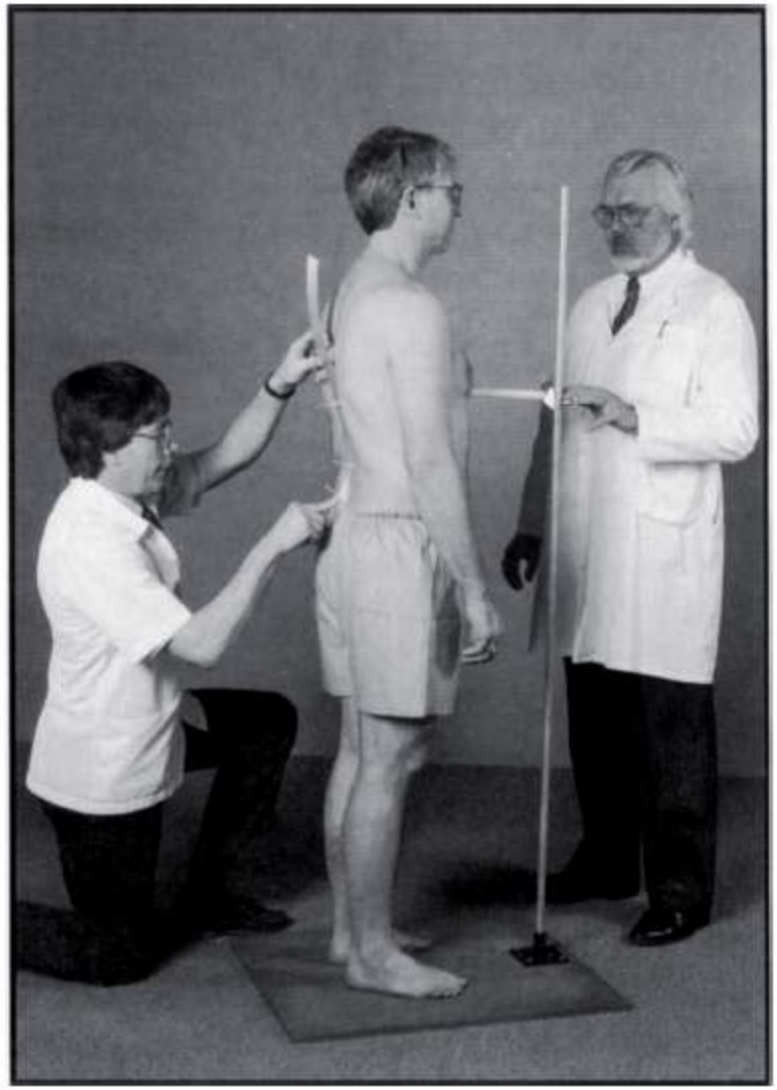


Fig. 3. Starting position for testing abdominal muscle performance.

Equipment:

- **Abdominal muscle test:** A goniometer was used to measure the angle of the legs in relation to the table.

Method



Procedures:

Location of bony landmarks.

- Palpation and marking of ASIS and PSIS and S2 and L3.
- Dowel mounted on stand against subject's sternum to control postural sway.
- Tracing of subject's feet on floor.

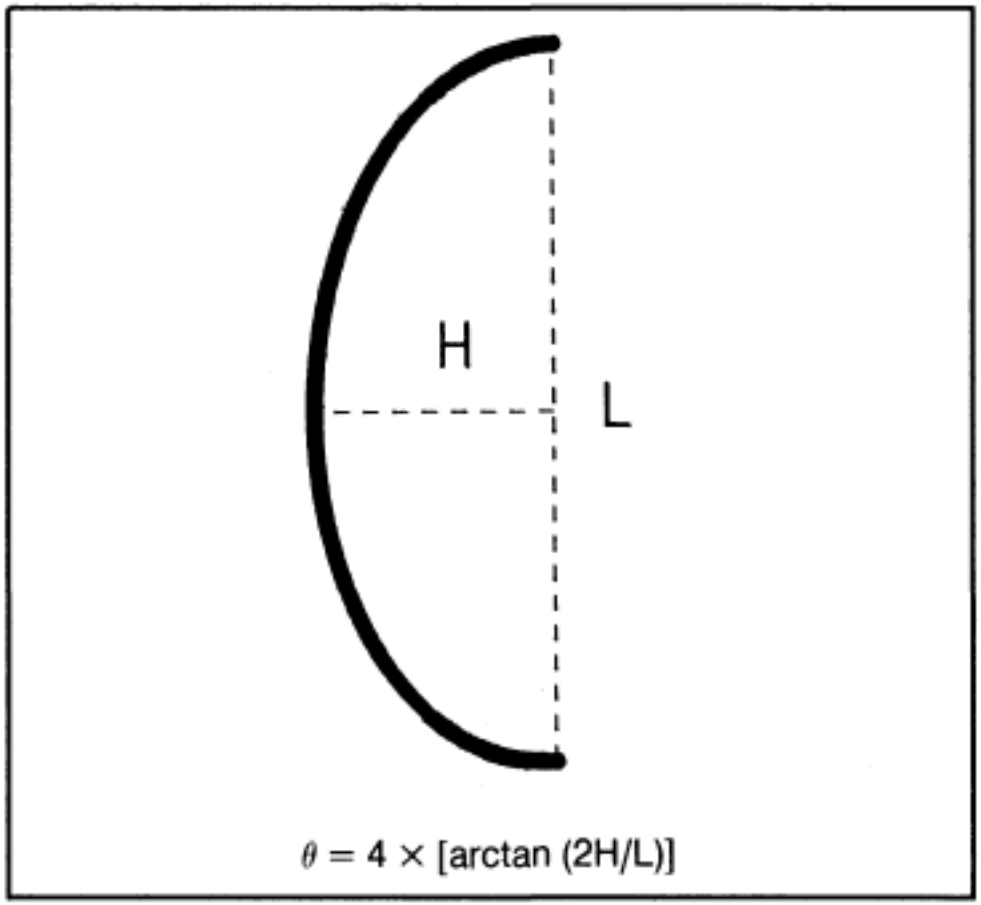
Method

Procedures:

Measurement of pelvic tilt.

– The arms of the inclinometer were placed on the marked ASIS and PSIS, angle of inclination were read and recorded.

Method



Procedures:

Measurement of lumbar lordosis.

- The flexible curve was pressed against the lumbosacral spine, and the points that intersected the markers were recorded.
- The curve was transferred onto paper.
- These two measurements were used to calculate Theta (θ), an index of lordosis, using the following formula:
- $\theta = 4 \times [\arctan (2H/L)]$

Method

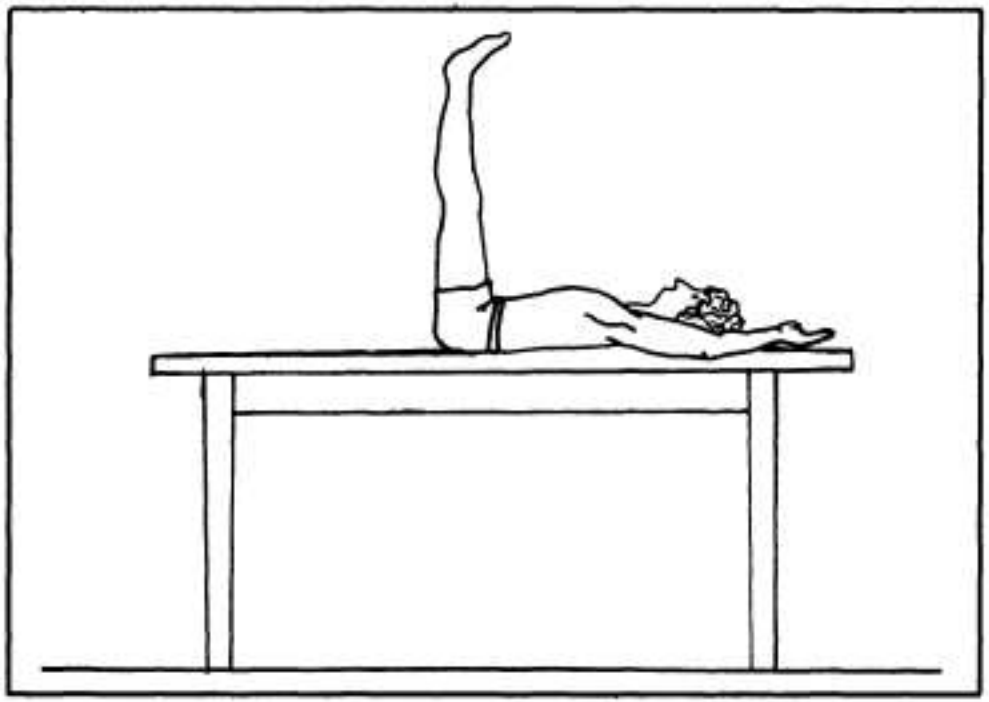
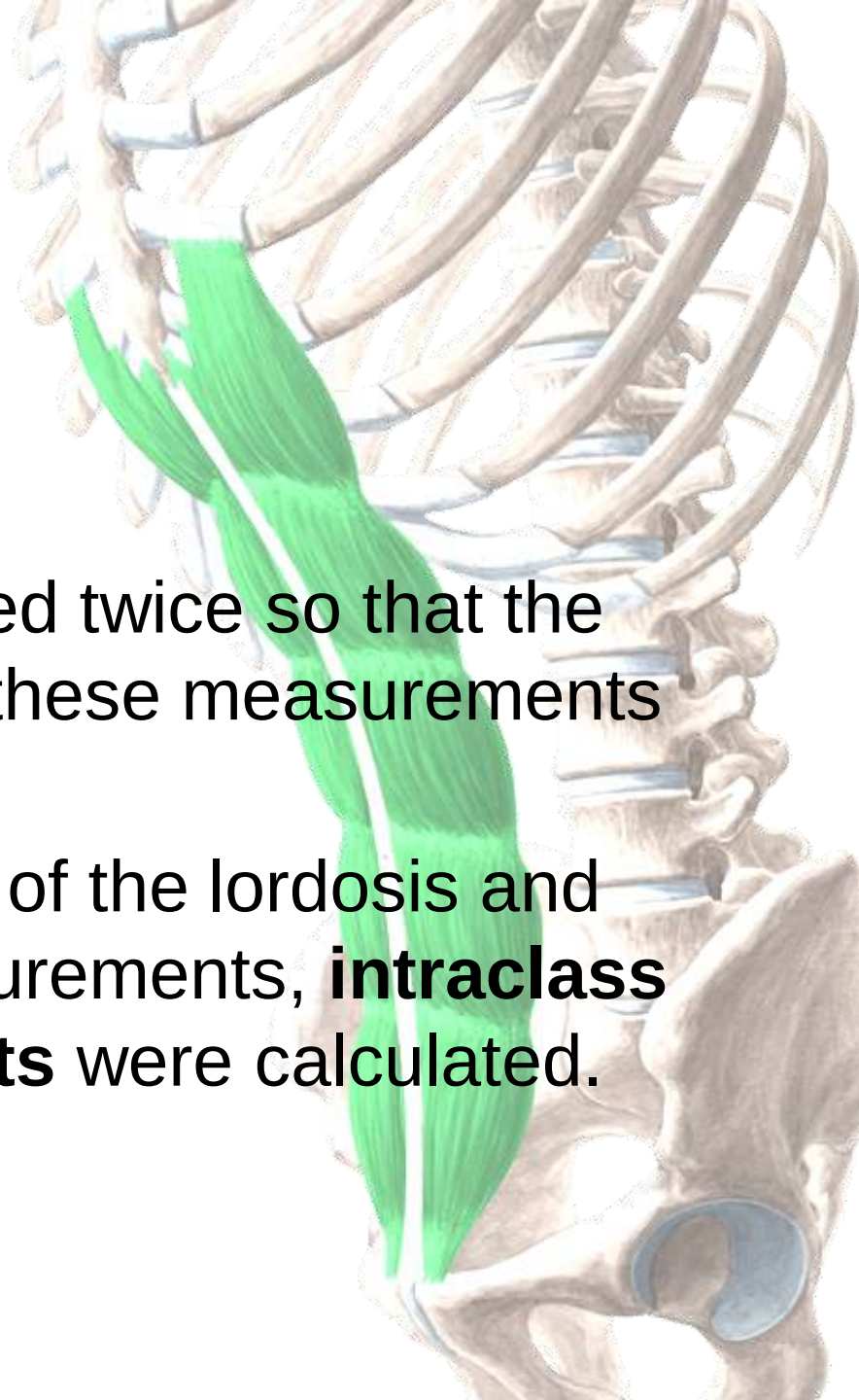


Fig. 3. Starting position for testing abdominal muscle performance.

Procedures:

– **Abdominal muscle test:** Kendall and McCreary protocol.

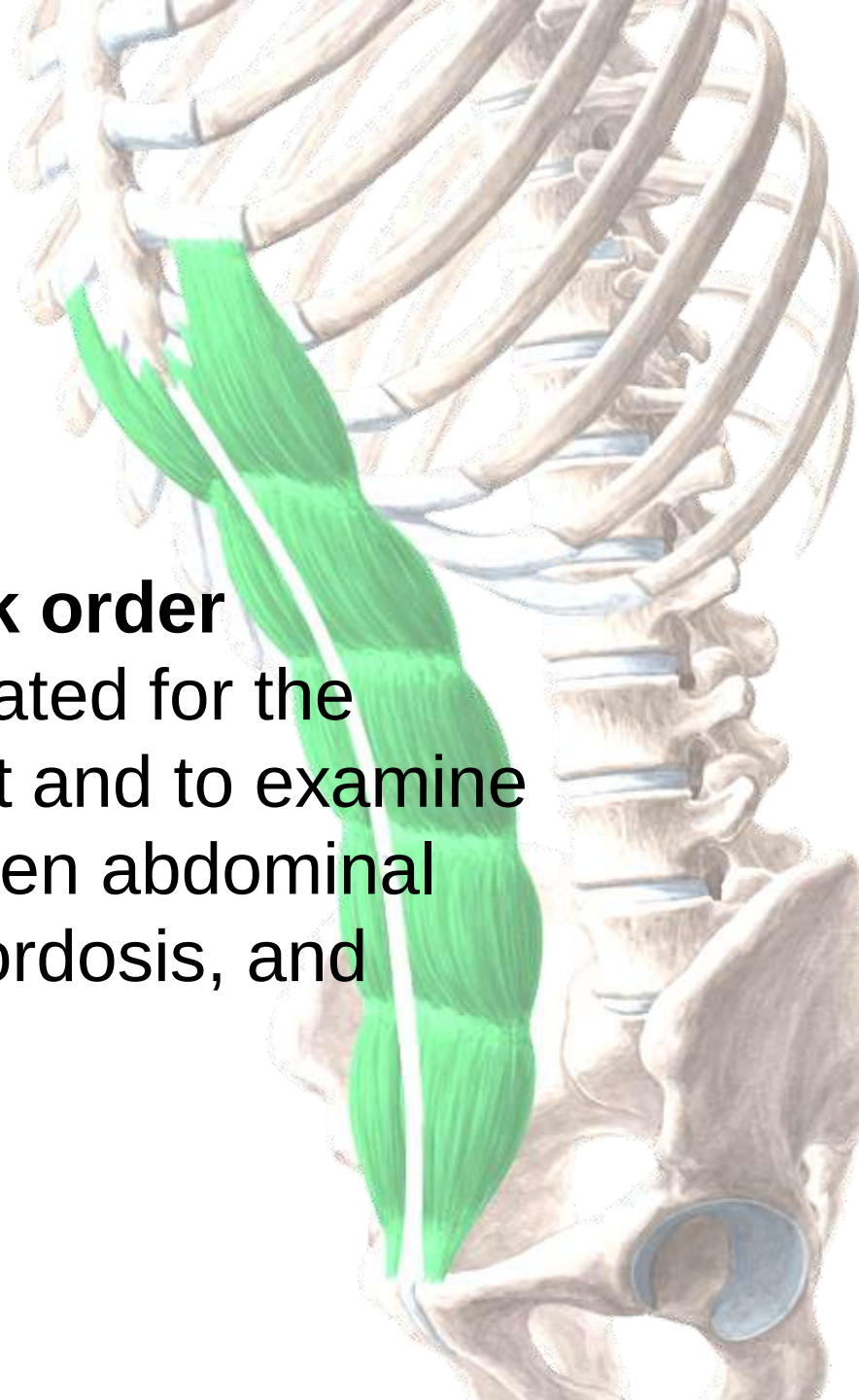
Method



Data Analysis

- Each test was performed twice so that the intratester reliability of these measurements could be determined.
- To test the reliability (r) of the lordosis and pelvic inclination measurements, **intraclass correlation coefficients** were calculated.

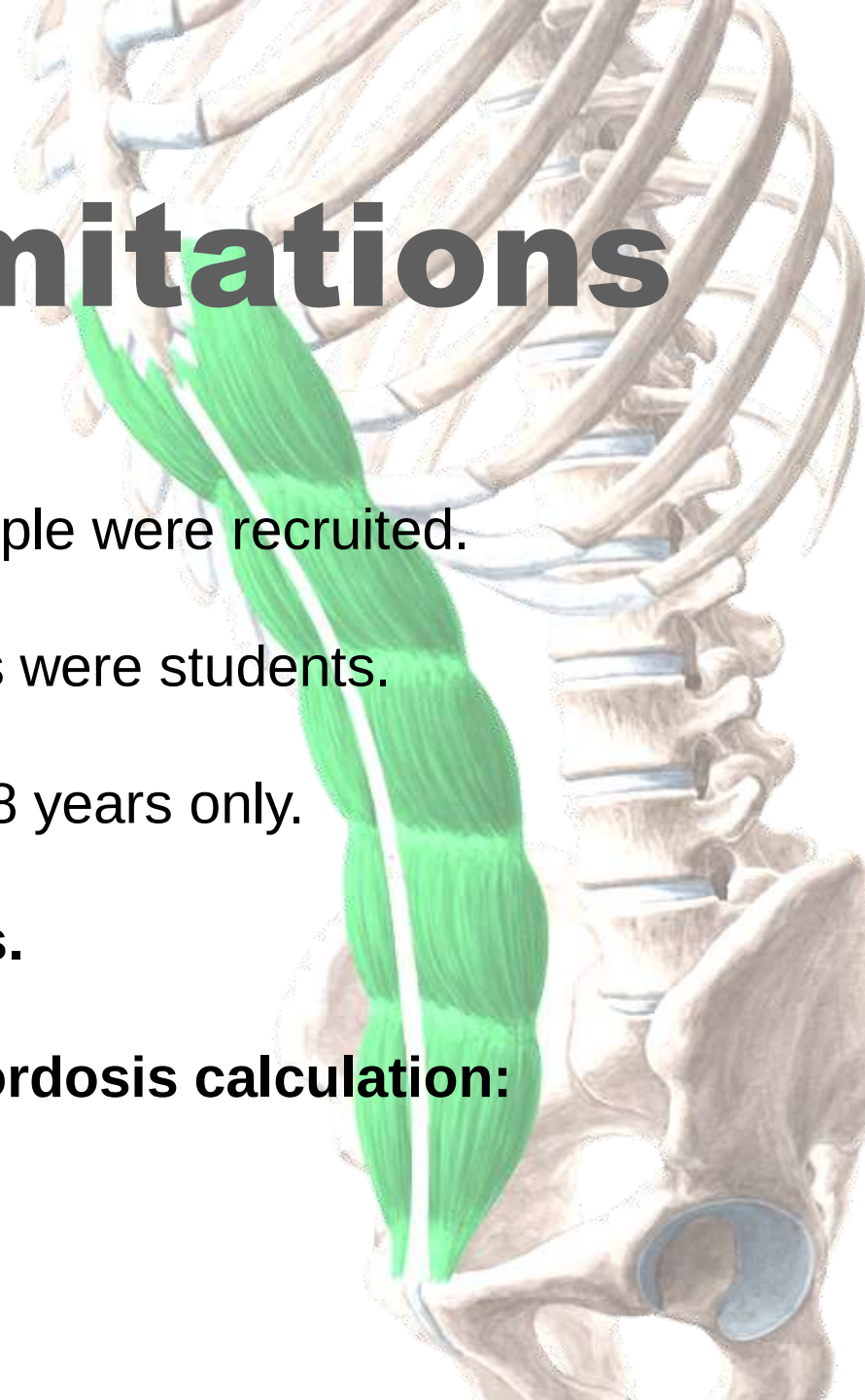
Method



Data Analysis

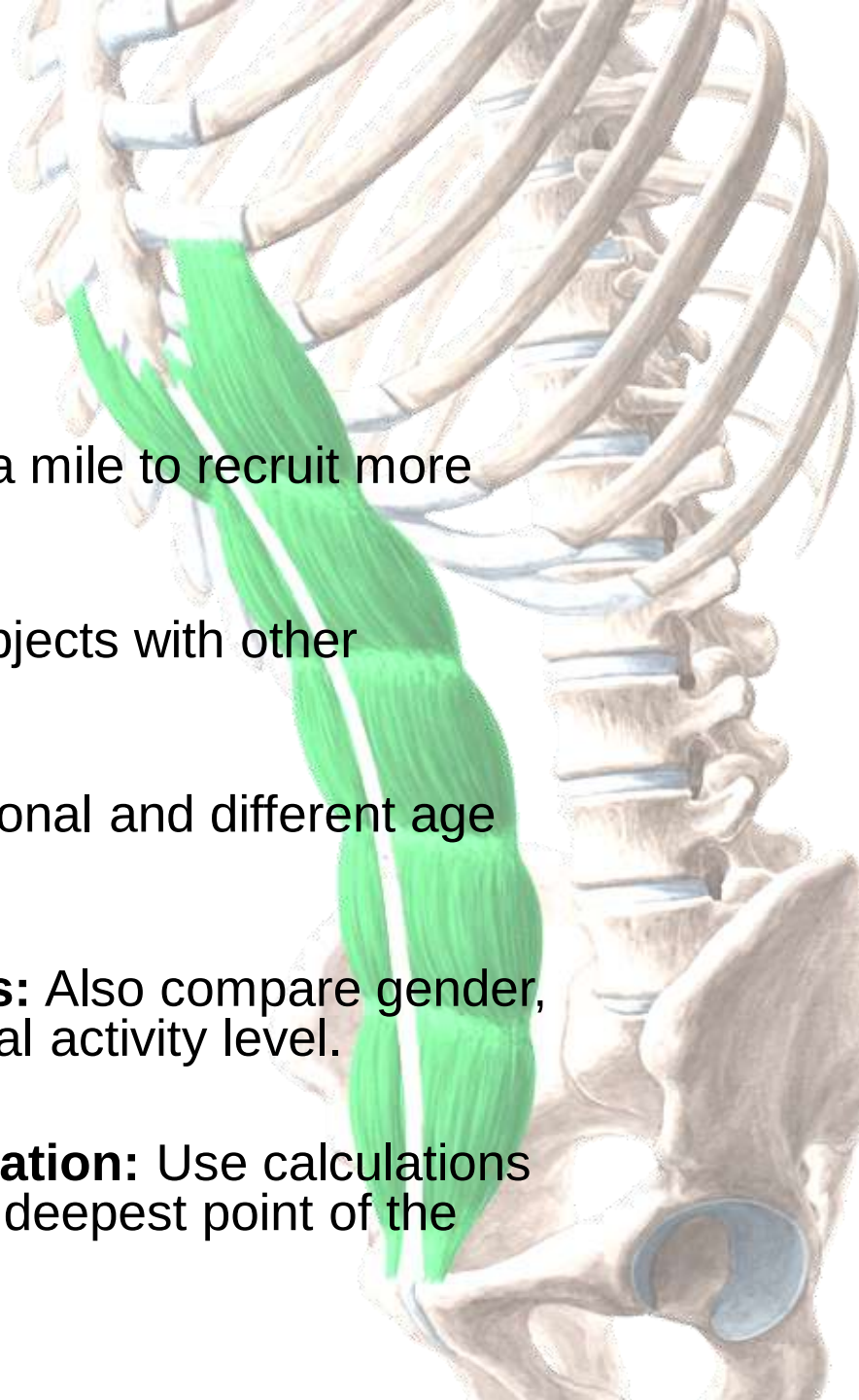
- **Spearman's RHO rank order correlation** was calculated for the abdominal strength test and to examine the relationships between abdominal muscle performance, lordosis, and pelvic tilt.

Errors & limitations



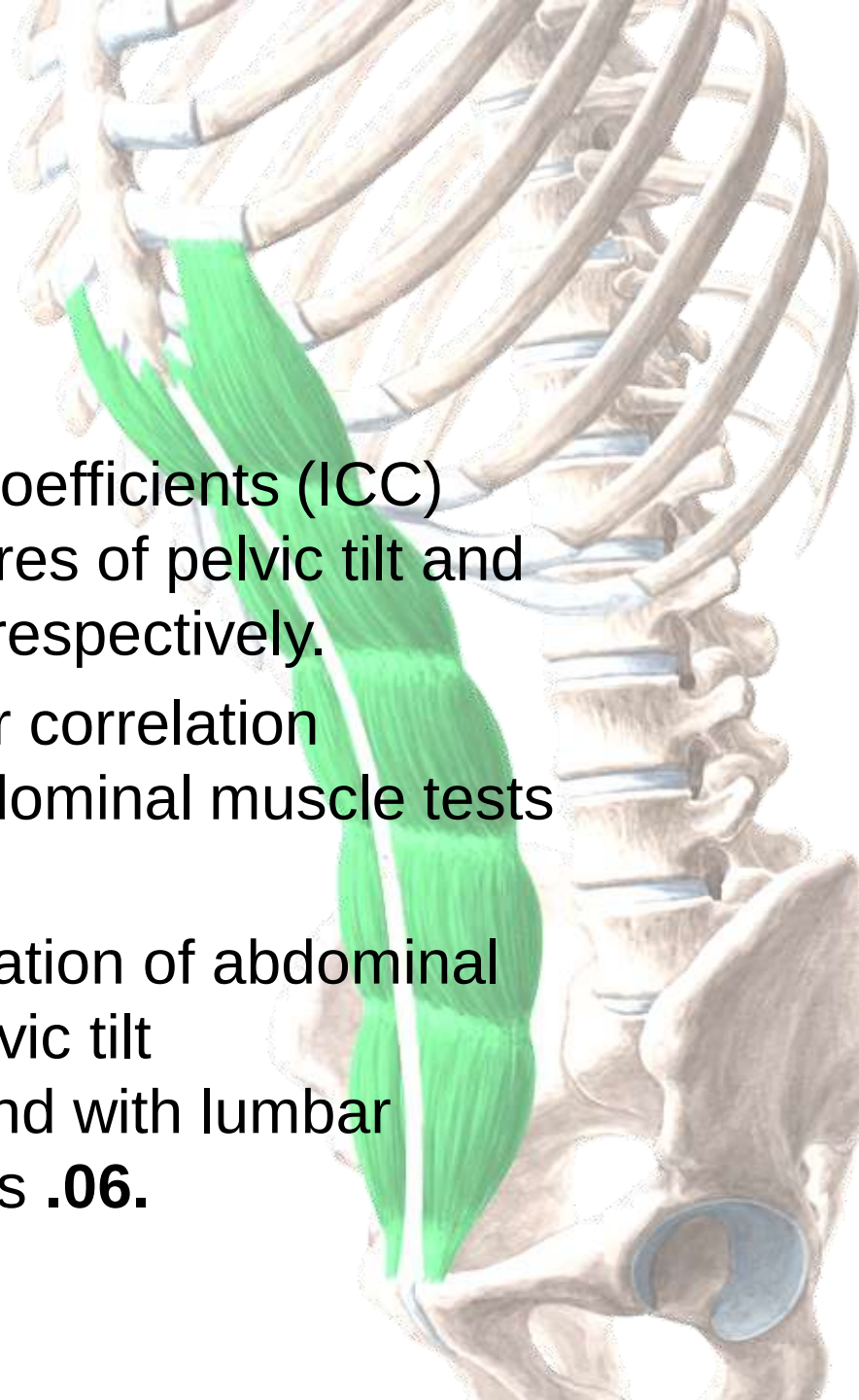
- **Small sample size:** Only 31 people were recruited.
- **Limited population:** All subjects were students.
- **Age range too narrow:** SD = 3.8 years only.
- **Limited amount of correlations.**
- **Questionable type of lumbar lordosis calculation:** Midpoint vs. deepest point.

Solutions



- **Small sample size:** Go the extra mile to recruit more subjects to increase test validity.
- **Limited population:** Recruit subjects with other backgrounds.
- **Narrow age range:** Using additional and different age groups.
- **Limited amount of correlations:** Also compare gender, body mass index (BMI) & physical activity level.
- **Type of lumbar lordosis calculation:** Use calculations that measure and determine the deepest point of the lumbar curve.

Results



- The intraclass correlation coefficients (ICC) values for repeated measures of pelvic tilt and lordosis were **.84** and **.90**, respectively.
- The Spearman's rank order correlation coefficient for repeated abdominal muscle tests was **.71**.
- The Spearman's rho correlation of abdominal muscle test values with pelvic tilt measurements was **0.18** and with lumbar lordosis measurements was **.06.**

Results

“We found no correlation between abdominal muscle strength, pelvic tilt, and lumbar lordosis.”

Walker ML, Rothstein JM, Finucane SD, Lamb RL.
Relationships between lumbar lordosis, pelvic tilt, and abdominal muscle performance.
Phys Ther. 1987;67:512-5.