Purpose/Hypothesis
The Modified Thomas Test (MTT) is commonly used to determine iliopectineus (IP) and rectus femoris (RF) tightness, which is usually assessed visually and subjectively. The purpose of this project was to determine the reliability when measuring IP tightness and RF tightness using goniometry against digital photography.

Number of Subjects
22 females and 8 males (mean age = 27.40 years; SD = 4.19).

Materials/Methods:
The subjects were assessed by a physical therapist with over 25 years of experience. The Modified Thomas Test (MTT) is commonly used to determine iliopsoas tightness) and three measures of knee flexion (for rectus femoris tightness, which is usually assessed visually and subjectively. Two subjects were subjectively classified as positive for IP tightness and all 30 subjects were positive for RF tightness using the MMT. The subject’s right lower extremity was photographed using a Canon SX20IS digital camera when the MTT was administered. Three measures of hip extension (for iliopsoas tightness) and three measures of knee flexion (for rectus femoris tightness) were then obtained using a standard goniometer. Three weeks after initial testing, the subjects were reassessed by the physical therapist using digital photography and the MMT. The subject’s right lower extremity was photographed using a Canon SX20IS digital camera when the MTT was administered. The subjects were assessed by a physical therapist with over 25 years of experience.

Results
The mean for IP tightness during the MTT using goniometry was 15.84 deg. (SD = 5.81); when using photography, the mean was 14.85 deg. (SD = 5.69). The mean difference between the two techniques was 0.99 deg. There were no significant differences in means between the two methods (t = 1.59; df = 29; p = .12). The ICC (3,2) for the within-measures when using goniometry was .98 (95% CI = .97 - .99); for photography, the ICC (3,2) was .96 (95% CI = .94 - .98). The ICC (2,2) for agreement between goniometry and photography was .97 (95% CI = .95 - .99). From the Bland-Altman plots, there was no bias between measures obtained using the two measurement methods, and any differences between methods were not clinically important.

Rectus Femoris (Knee Flexion)
The mean for RF tightness during the MTT using goniometry was 50.13 deg. (SD = 12.42); when using photography, 51.46 deg. (SD = 10.90). The mean difference between the two techniques was 1.33 deg. There were no significant differences in means between the two methods (t = 0.93; df = 29; p = .36). The ICC (3,2) for the within-measures agreement using the goniometer was .99 (95% CI = .98 - .99); for photography, the ICC (3,2) was .97 (95% CI = .95 - .99). The ICC (2,2) for agreement between goniometry and photography was .97 (95% CI = .95 - .98). From the Bland-Altman plots, there was no bias between measures obtained using the two measurement methods, and any differences between methods were not clinically important.

Interpreting the Bland-Altman results
Bland-Altman plots are generally interpreted informally.
- Ask yourself these questions
  - How big is the average discrepancy between methods (the bias)?
  - You need to do this clinically.
  - Inspect the bias line (the line for the differences between measures).
  - How far is that line from zero?
  - Is that discrepancy large enough to be important? (Again, this is a clinical question and not a statistical one.)
- Use 2 standard deviations to help us to see the range around the bias line.
- Does the scatter around the bias line get larger as the average increases?

Conclusions
There was substantial within-measures agreement for both goniometry and digital photography, and there was substantial between-measures agreement between the two methods when assessing IP and RF tightness. Any differences between goniometry and photography were not considered clinically important.

Clinical Relevance
Clinicians may consider goniometry or digital photography as more objective methods than visual inspection for assessing IP and RF tightness when administering the MTT.