Iowa State University

Iliotibial band strain while running around a radius

Honors Poster Presentation

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INTRODUCTION

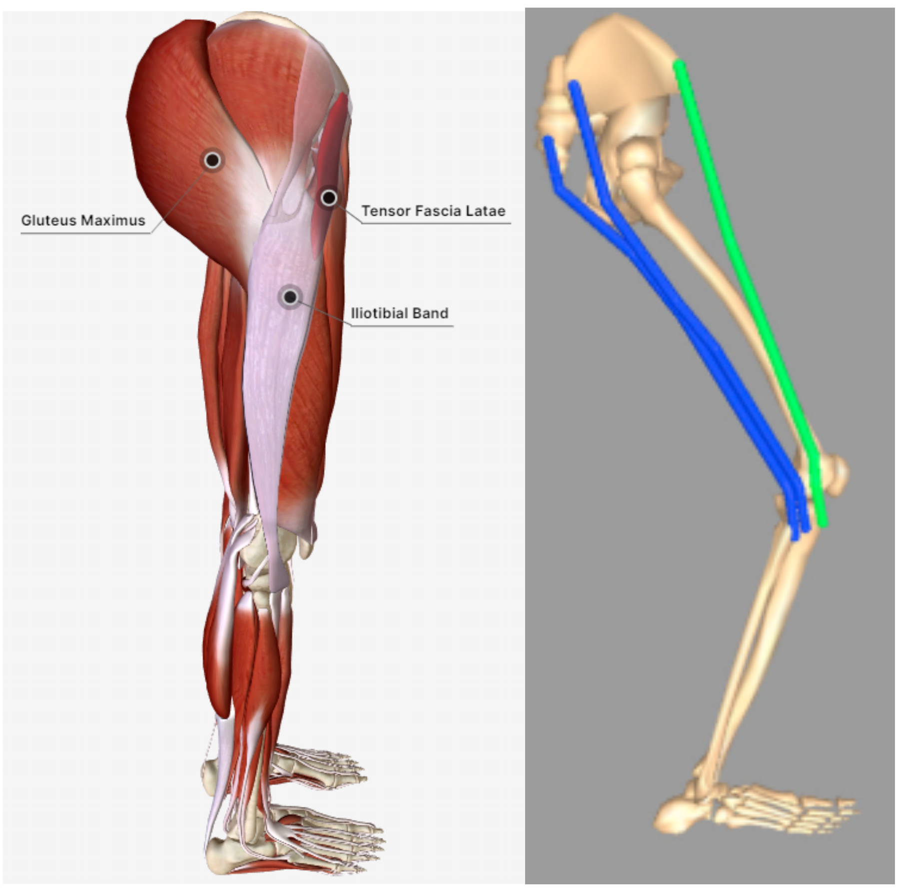

Figure 1: Iliotibial band model: An anatomical model (left), and the model from Eng et al. [2] (right) showing two attachments in the gluteus maximus (blue) and one attachment in the tensor fascia latae (green).

- The iliotibial band (ITB) originates on the pelvis, with attachments to the tensor fascia latae (TFL) and gluteus maximus (GMax). It runs laterally down the thigh and attaches below the knee. (Figure 1)
- Iliotibial band syndrome (ITBS) is one of the most common injuries in runners and is described as pain and inflammation due the ITB rubbing across the lateral femoral condyle.
- Studies have found an increase in iliotibial band strain in runners who develop ITBS [1]
- Strain is caused by forces generated by the TFL and GMax that stretch the ITB, as well as passive stretch in an unattached section of the ITB. These portions of strain are estimated in a model developed by Eng et al. [2] and shown in Figure 1.
- Running on a radius may increase these strains due to the asymmetric nature of the activity.

OBJECTIVE

- Identify how strain in the iliotibial band changes when runners run around a radius, such as a 400m track, compared to a straight line path.
- Determine if running around a radius could lead to increased risk of ITB syndrome.

METHODS

- 10 subjects, (5 M, 5 F), age: 20.4 ±1.4 years with a weekly running mileage of 34.8 ± 15.2 miles and no lower extremity injuries completed the study.
- 19 reflective markers were placed on participants right lower extremity (Figure 2).
- Kinematic data were collected using 12 infrared cameras and ground reaction forces were collected using a force platform (sampling rate 225 Hz).
- Subjects ran across a force platform staying at ± 5% of their 10km training pace, completing 10 trials each of the following conditions:
  1. A straight line path
  2. A radius of 36.5m with their right leg on the outside of the curve
  3. A radius of 36.5m with their right leg on the inside of the curve
- Kinematic data were analyzed with MATLAB using a rigid body model, musculoskeletal model and an ITB model based on Eng et al. [2]
- Strain was estimated as a percent change in length of four portions of the ITB: passive, tensor fascia latae insertion and two gluteus maximus insertions.

Figure 2: Reflective markers placement for motion tracking

RESULTS

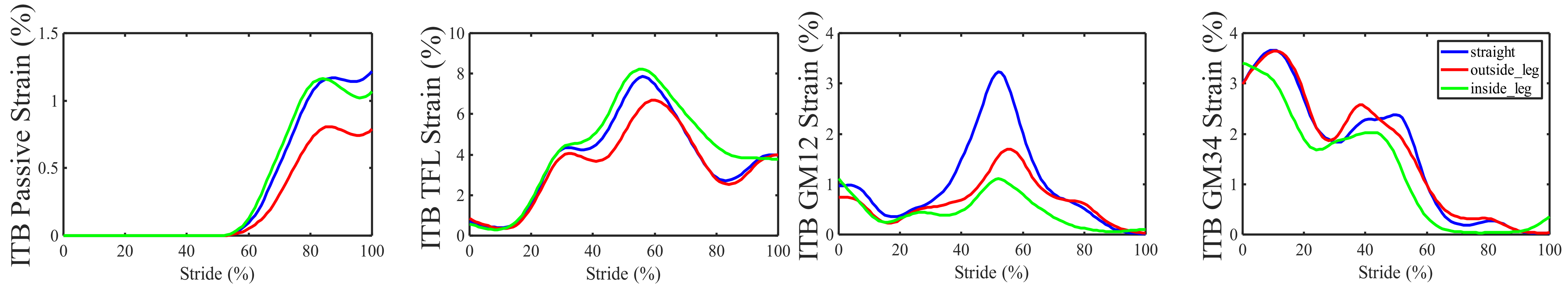

Figure 3: Average iliotibial band strain over one stride.

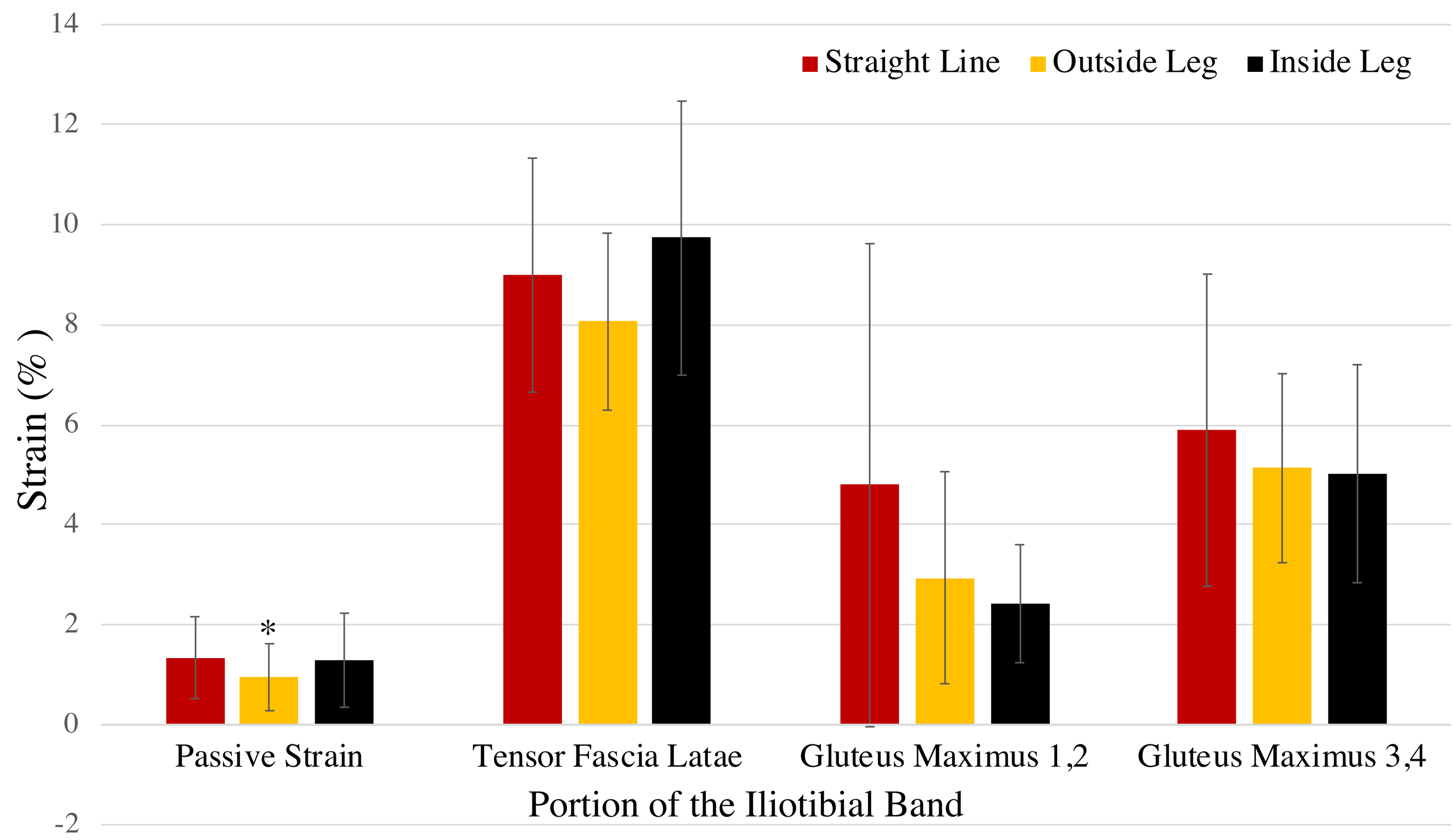

Figure 4: Average peak strain in the four potions of the ITB with error bars representing standard deviation. * Represents significance at $p < 0.05$ level.

- Repeated measures ANOVAs found no significant differences in strain between any of the conditions in the TFL, GMax1,2 or the GMax 3,4 portions of the ITB.
- The only significant differences found were within the passive peak strains. Paired t-tests showed the outside leg was significantly lower than both the straight line path and the inside leg conditions.

CONCLUSION

- The most strain occurred in the TFL strand of the ITB.
- The only significant difference between the running conditions was the passive peak strain in leg on the outside of the radius, which was also the smallest change in strain between the portions of the ITB.
- Looking at the other three portions, the standard deviation between subjects was very large.
- These current results indicate that running around a radius doesn't significantly change the strain within the ITB. This suggests running around a radius, or track doesn't increase or decrease the chances of developing ITBS.

REFERENCES

[1] Hamill, J., Miller, R. H., Noehren, B., & Davis, I. S. (2008). A prospective study of iliotibial band strain in runners.*Clinical Biomechanics*, 23 (8), 1018–1025

[2] Eng, C. M., Arnold, A. S., Lieberman, D. E., & Biewener, A. A. (2015). The capacity of the human iliotibial band to store elastic energy during running. *Journal of biomechanics*, 48(12), 3341-3348.