

Biomechanical Causes of In-toeing

1. Increased internal tibial torsion

- a. tibial torsion refers to the transverse plane rotation of the distal aspect of the tibia relative to the proximal aspect
- b. At birth -- 0 degrees
- c. Adult -- 18-23 degree external
- d. **Decreased (internal) tibial torsion could cause in-toeing**

2. Increased femoral anteversion

- a. At birth, the angle of anteversion is about 60° externally rotated in the transverse plane with respect to the frontal plane
- b. During development, the hip undergoes a 50° internal change to finish with the normal adult value of 10° external.
- c. This change allows for better seating of the femoral head within the acetabulum.
- d. **Increased femoral anteversion would lead to in-toeing**

3. Increased metatarsus adductus

4. Increased femoral torsion

- a. At birth, the angle is about 30 degrees internally rotated and normal adult femoral torsion is about 10 degrees internally rotated
- b. If the angle of femoral torsion is greater than normal (or greater than 10° internal), then this would indicate a less-than-normal developmental external torsional change
- c. **Clinically, this may be a cause of in-toeing.**