Variations in Gait: Intoeing

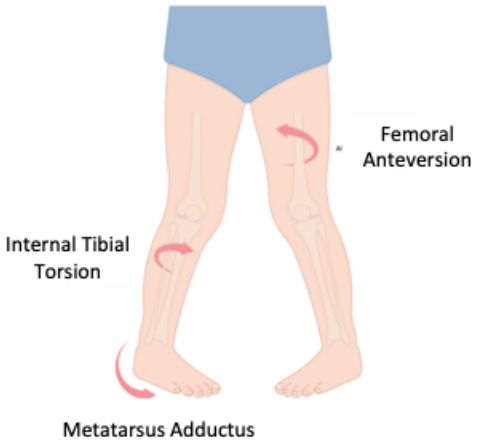
By Renfrew's PT Team

Intoeing Quick Facts

- Intoeing (or "pigeon toeing") is defined as the rotational variation of the lower limb where the feet or toes point toward the midline during standing or walking.
- Intoeing is a common anatomical finding in young children.
- In most cases, intoeing is a normal variation of development, is asymptomatic, and does not require intervention.
- Persistent intoeing often does not impact function.
- There is a small subset of children for whom intoeing is a sign of an underlying health condition or who will require specialized intervention.

Common Causes of Intoeing

Intoeing is caused by internal rotation at any part of the lower limb. There are three common causes of lower limb rotation and each is more prevalent at different ages.



	I. Metatarsus adductus	II. Internal tibial torsion	III. Femoral anteversion
Description	Metatarsus adductus is characterized by the angulation of the metatarsals (toes) giving the foot a "kidney bean" shape.	Internal tibial torsion is characterized by the internal rotation or "twisting" of the tibia (large shin bone).	Femoral anteversion is characterized by the internal rotation or "twisting" of the femur (thigh bone).
Most common age group	Birth to 1 year of age.	1 to 3 years of age.	3 to 8-10 years of age.
Natural history	90% cases of metatarsus adductus resolve during the first year.	Children are born with ~5 degrees of internal tibial rotation that gradually rotates to ~10 degrees of external tibial rotation by 8 years of age. 90% cases of excessive tibial rotation corrects by 8 years of age.	The femur naturally rotates during development. At birth, normal anteversion is 30-40 degrees and gradually decrease to ~15 degree by maturity. 99% cases of excessive femoral anteversion corrects by 8-10 years of age.

Note: Intoeing may be associated with diagnoses of cerebral palsy, spina bifida, hip dysplasia or genetic disorders that result in hypermobility of the joints. In these cases, physiotherapists may be part of a team of specialists to help address muscle tone and length, joint health, functional strength, and mobility.

To Treat or Not to Treat?

- Intoeing typically resolves spontaneously without treatment.
- Evidence suggests that orthotics (i.e., braces or splints), specialized footwear, and stretches/exercises do not affect natural history or help resolve intoeing faster.
- When it persists, intoeing may not impair function or cause adverse outcomes in older children and adults.
- Talk to your physiotherapist or family physician with concerns of any of the following (related to intoeing):

- The child complains of hip, knee, or foot pain with or without limping.
- There is unilateral or asymmetric intoeing.
- There are sudden changes in foot of ankle positioning.
- The child experiences daily recurrent trips or falls.
- The child has a history of abnormal birth or development.

- Intoeing affects the child's function or gross motor development (e.g. balance or coordination impairments, hip or lower strength weakness, difficulty keeping up with peers, or activity limitations).
- The child is older than ~10 years of age with significant intoeing.

The Role of a Community Physiotherapist

- Complete screen or assessment to determine if intoeing is adversely affecting the child's function or ability to attain age-appropriate gross motor skills.
- If indicated, may develop an exercise program to promote the development of gross motor skills (see example below).
- Provide education about sitting, sleeping, and play positions that support healthy development and posture.
- Provide parent and caregiver education about children's physical and gross motor development.

References

Berry, K. (2018). Evidence-based management of in-toing in children. *Clinical Pediatrics, 57*(11), 1261-1265.

Cao, L. (2022). When to be concerned about abnormal gait: toe walking, in-toeing, out-toeing, bowlegs, and knock knees. *Pediatric Analogue, 51*(9), 340-345

Davis, L., & Nativio, D. (2018). Addressing pediatric intoeing in primary care. *The Nurse Practitioner, 43*(7), 31-35.

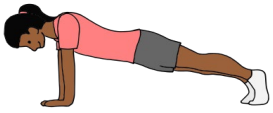
Jones, S., Khandekar, S., & Tolessa E. (2013). Normal variants of the lower limbs in pediatric orthopedics. *Internal Journal of Clinical Medicine, 4*(7B)*,* 12-17.

Rosenfeld, S. (2020, November). Approach to the child with in-toing. UpToDate. https://www.uptodate.com/contents/approach-to-the-child-with-in-toeing.

Sielatycki, J., Hennrikus, W., Swenson, R., Fanelli, M., Reighard, C., & Hamp, J. (2016). In-toeing is often a primary care orthopedic condition. *The Journal of Pediatrics, 117*, 297-301.

Uden, H., & Kumar, S. (2012). Non-surgical management of a pediatric "intoed" gait pattern- a systematic review of the current best evidence. *Journal of Multidisciplinary* Healthcare, 5, 27-35.

Exercise Ideas

Play positions	Encourage play in the following positions: - 4-point kneeling. - Half kneeling. - High kneeling. - Side sitting. 
Sitting positions	- Crisscross sitting. - Complete activities while sitting on a peanut ball. - Sitting on chair so that hips, knees, and ankles rest at 90 degrees. 
Static balance	- Single leg balance. - Standing with one foot propped on ball. - Tandem balance (one foot place directly in front of the other. - Tip-toe balance (standing on tip-toes without moving). - Yoga poses like tree, chair pose, warrior, or lunge pose (keep toes pointing forward as able). 
Dynamic balance	- Tandem walking and side stepping along line or balance beam (keep toes pointing forward as able). - Tip-toe walking. - Walking up and down stairs with alternating gait pattern. - Stop and go games (e.g. “red light, green light”). - Obstacle courses. - Front and back weight shifting (e.g. switch from standing on heels to standing on tiptoes holding onto table for support). - Marching on unstable surface. - Quadruped alternating opposites. 
Functional strength	- Sit to stands from low stool (avoid using hands). Use footprint floor markers to promote toes pointing forward. - Step-ups. - Animal walks: crab, bear, and penguin walks (walking with toes pointing outwards). - Wall sits and squats. Use footprint floor markers to promote toes pointing forward. - Bridges (and single leg bridges). - Sumo walks (lateral steps). 

	- Planks. - Standing hip aduction (i.g., lateral hip raises).
Coordination	- Jumping forward, backward, and sideways (two foot take-off and landing). Use footprint floor markers to promote toes pointing forward. - Jumping over small obstacles. - Hopping on the spot and forward. - Jumping jacks. - Skipping and galloping. - Cross crawls. - Passing soccer ball back and forth with partner (contact ball with inside of foot).