INFINITY PEDIATRICS

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GAIT CONCERNS IN CHILDREN

Normal Evolution of Gait
Gait is term used to describe walking and running patterns.

When infants start to walk, they are generally quite uncoordinated with a wide-based gait, and will hold out their arms as this improves balance. They also often will have their legs in an *externally rotated* position (with their feet pointing outwards). They may appear to be bow-legged (with an outward curve of the legs at the knees), and their feet often appear flat. How they walk changes a lot during the first 6 months.

As their walking improves, their stride length will increase and their gait should become steadier. Their base of support will slowly become narrower, and they will lower their arms. Running typically appears a few months after walking starts, and is often accompanied by many falls. Both walking and running are often flat-footed still at this stage, although some children may intermittently walk on their toes.

By age 3, most children will have developed enough coordination to walk with a heel strike like adults, where their heel hits the ground first and then they push off with their toes. Most children aged 3-6 have some degree of knock knees, a condition where their knees tilt inwards, while their ankles remain spaced apart.

By age 8, most children have a walking gait that is very similar to adults. Also by this age, their legs are usually well-aligned.

Typical progression of leg alignment

Common Concerns

Bowlegged
If the knees are further apart and there is extra space in between the legs, it is called bowlegged or genu varum. It is often caused by the bones of the lower leg (tibia & fibula) being angled *towards* the midline of the body. As noted in figure above, this is a normal variation, especially in first few years of life

Knock-kneed
When the knees are closer together or touch, this is called knock-kneed or genu valgum. It is often caused by the bones of the lower leg (tibia & fibula) being angled *away* from the midline of the body. As noted in figure above, this is a normal variation as gait changes from bowlegged to straight to knock-kneed, often starting at age 2-4 years.

In-toeing Gait (Pigeon-Toeing)
This is a variation of gait in which the feet or toes point inwards during walking or running. In-toeing is one of the most common variations in gait. Most children with in-toeing will grow out of this over time without any intervention. In-toeing generally does not cause pain with walking or running or get in the way of normal development milestones. Children with in-toeing may be clumsier and trip more than children without it, especially if they are tired.

The most common causes of in-toeing are due to foot shape, *internal tibial torsion* (twisting of the shinbones inward), or *femoral anteversion* (twisting of the thigh bones inward). These conditions may also occur together. These are often a variation of normal muscle and bone development.

Out-toeing Gait
This is a variation of gait in which the feet or toes point outwards while walking or running. Out-toeing is also a common variation in gait in infants. Out-toeing is most often caused by tight hip muscles, which usually resolves after the infant has been walking for a few months. This muscle tightness does not typically cause any pain with walking, or interfere with the normal developmental milestones.

Other causes, more common in older children, include *external tibial torsion* (twisting of the shinbones outward) and *femoral retroversion* (twisting of the thigh bones outward). If an older child has out-toeing, this is a reason to speak with your Health Care Provider.

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Flat Feet
Flat feet are normal in infants and young children. Foot arches will develop starting at age 3-4 years old throughout childhood until about age 10. You will likely be able to see more of an arch in the foot when your child goes up on their toes. Even in older children, flat feet rarely cause problems and no treatment is generally recommended.

Toe Walking
Toe walking is particularly common in young children who are just starting to walk. Usually this will resolve over time without intervention. If the child can comfortably alternate between walking flat-footed (or with a heel-toe gait if they are older) and toe-walking, it is generally not a concern.

In most children, toe walking usually starts out as a habit. However, over time, the calf muscles can get tight, which makes it hard for the foot to be flat on the ground. You can test this but simply flexing your child's foot, moving their toes towards their head. If it's hard to move the foot, the calf muscles are tight. In this case, daily stretching exercises can be performed. Also, try to have your child wear indoor shoes in the house to help flex the foot. Sometimes, physiotherapy is needed to help stretch out the muscles.

Limp
Onset of limp is almost always caused by a minor injury. Sometimes a limp can be a result of a more serious injury such as a joint sprain, dislocation, or fracture. There can be other, rarer, conditions that can cause limp such as joint infections, childhood arthritis, tumours, cerebral palsy, leg length discrepancy, or hip dysplasia. You should seek care if your child has a peristent limp.

Bone Health
Proper nutrition is essential to bone health, especially calcium and vitamin D. Dairy is an excellent source of both, but a varied diet with all 4 food groups is important. In Canada, vitamin D supplements are also recommended – ask your pediatrician how much is needed for your child.

Furthermore, weight-bearing exercises helps strengthen your muscles, which also helps keeps your bones strong. Did you know that you develop all the bone mass for your whole life in the first 20-25 years? So talking about bone health in kids and teens is very important!

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When to Talk to Your Healthcare Provider

Normal development of motor milestones and gait requires coordinated development of the muscles, bones, and nervous system. If a child's development of motor milestones or gait is abnormal, it could indicate an issue in one of these systems. If you see any of the following red flags or have other concerns, please speak with your Health Care Provider.

Red Flags for Gait

- Child is not following the normal progression for gait development
- Family history of delayed motor development or muscle disease
- Pain with walking or running, especially with new-onset limp or other symptoms of illness
- Refusal to weight-bear or walk
- Long-standing limp with or limp without pain
- Joint swelling or redness
- In-toeing or out-toeing on only one side, or with one side much worse than the other
- Bow-legs that worsen after age 2, or are asymmetric
- In-toeing that is asymmetrical, causes pain or limp, gets worse after age 5, or is persistent past age 8 with functional problems
- Out-toeing that is asymmetrical, causes pain or limp, or is present in older children
- Flat feet that cause pain
- Toe-walking with difficulty switching back to flat-footed walking (toddler) or heel-toe walking (older child)