Down Syndrome:
- Individual has three, rather than two, copies of the 21st chromosome.
- Occurs in roughly 1 in 700 live births.
- 80% of children with Down syndrome are born to women under 35 years of age.
- General Characteristics include:
  - Low muscle tone, small stature, pes planus, ligamentous joint laxity, an upward slant to the eyes, congenital heart defects, respiratory and hearing problem, childhood leukemia, and balance issues.
- On average, children with DS walk independently at 24 months (1 year later than typical infants).

Common Foot Pathologies:
- All had ligamentous joint laxity.
- 90% had bony deformities including hallux valgus, metatarsus primus varus, syndactyly, calcaneal valgus, 60% were identified as having flat foot, with 16% rigid flat foot.
- 73% had postural alterations with abnormal step at various stages of the gait cycle.

Supramalleolar Orthoses:
- Stabilize the subtalar joint.
- Maintain the calcaneus in an upright position to improve bony alignment.
- Influence postural and gait characteristics.
- Control severe pronation and supination.
- Increase stability and promote earlier independent walking.
- Allow ankle dorsiflexion/plantarflexion and limit inversion/eversion.

SMO Recommendations
- SMOs should always be worn with socks and inside shoes.
- Best types of shoes to accommodate SMOs are regular gym shoes with laces or Velcro.
- On 1st day, wear for only 1 hour.
- Remove brace and inspect skin.
- If redness appears, it should go away in 20-30 minutes.
- If redness persists, call immediately to schedule appointment with orthotist.

Views On Orthoses Use in Children
- As soon as able to pull to stand and bear weight through feet need orthotic support.
- Once overstretched, ligaments are permanently damaged.
- Others believe only the arch (midfoot) needs support and toes should remain free.
- Most conservative view holds orthotics interfere with arch development and result in weak, malformed foot.

Evidence:
- Looper et al. used the GMFM to measure gross motor skill acquisition to determine the effectiveness of SMOs on children with Down syndrome.
- Control group scored significantly higher on the overall GMFM compared to treatment group who were trained for seven weeks.
- Use of orthoses appears to have a detrimental effect on overall motor skill development in infants and new walkers who have learned to walk while wearing the orthoses.
- Health care professionals may want to postpone the use of SMOs in children with DS until they have learned to walk independently.
- Selby-Silverstein and colleagues examined orthotic use in 3-6 year olds with DS.
  - They found that foot orthoses led to decreased ankle eversion in static standing.
  - A change in the initial contact from flat foot to heel strike.
  - Increase in walking speed.
  - Martin studied flexible SMO use in 3-8 year old children with DS.
  - Measured postural stability using GMFM and balance using the BOTMP.
  - Significant differences on GMFM score compared to control.
  - Significant difference in balance score on BOTMP compared to control.
  - Improvement in postural stability is possible through relatively short-term use of flexible SMOs.

Conclusions:
- SMOs appear to have best results when used in children beginning to walk who have severe to moderate pronation.
- Mild to moderate pronation may respond best without the use of any interventions.
- Flexible SMOs may encourage more natural development of balance reactions.
- By allowing toes to be free and experience normal sensory input.
- There are not enough studies to enable therapists to evaluate the effectiveness of bracing for toddlers with DS.

References: