



# Motor Development and Orthoses

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# Background Information

- ▶ Physical therapist for 26+ years
  - ▶ 6 years orthopedics and sports medicine
  - ▶ 20+ years in pediatrics
    - ▶ Early Intervention
    - ▶ Inpatient Acute Care
    - ▶ Hippotherapy
  - ▶ Faculty member teaching pediatrics for 17 years
  - ▶ Board member for Academy of Pediatric Physical Therapy



# My Interest in These Topics

- ▶ **Foot and ankle bracing (orthoses)**
  - ▶ Natural extension of what I saw working in adults and athletes
  - ▶ Clinical experience and research data tell me it works!
- ▶ **Down syndrome**
  - ▶ PT really has something to offer--all ages!
  - ▶ Tenacity and persistence!
  - ▶ Extended family member with Ds





**NAPTOWN  
ROLLER GIRLS**

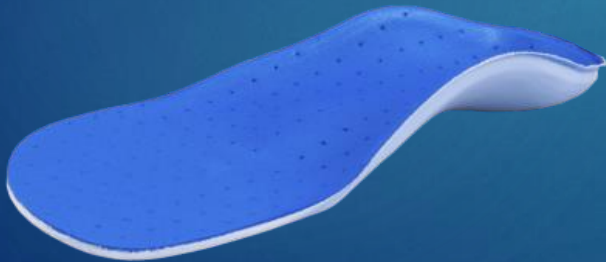
INDIANAPOLIS, IN

CELEBRATING 10 YEARS:  
2006-2016



# Common Orthoses for Down syndrome

- ▶ **Supramalleolar Orthosis (SMO)**
  - ▶ Comes just above the ankle bones
- ▶ **Foot Orthosis (arch support)**
  - ▶ Can be custom or off-the-shelf





# Orthoses for Ds: State of the Science

## ▶ What we know:

- ▶ Both foot orthoses and supramalleolar orthoses have been shown to improve balance and gross motor skills

## ▶ What we don't know

- ▶ Who needs the greater support of SMO and who will be ok with just the arch support
- ▶ When to start and stop using them

# SureStep SMO

- ▶ SureStep specifically designed for kids with low muscle tone
  - ▶ Midwest Orthotic and Technology Co.
  - ▶ [www.surestep.net](http://www.surestep.net)
- ▶ Unique trim lines
- ▶ Flexible—like a plastic milk jug



# SureStep SMO

- ▶ Allows kids to develop balance reactions
- ▶ Allows for running and jumping
- ▶ Allows for development of strength vs. passive reliance on brace
- ▶ Very well tolerated by kids



# SureStep SMOs: What We Know

- ▶ Past studies show improved gross motor skills for children with Ds who are already walking
  - ▶ Improved walking, running and jumping
  - ▶ Improved balance
  - ▶ Improved confidence in trying new skills
- ▶ My experience: improvement well after PT has stopped and child is walking well

# SureStep SMOs: Current Questions

- ▶ When is the right time to begin using them?
  - ▶ My opinion: when a child is interested in being on his/her feet
- ▶ When is the right time to stop using them?
  - ▶ My opinion: Individuals with Ds could use life-long support, but specific type (SMO vs. arch support) is up for discussion
- ▶ How much of the day should a child wear them?
  - ▶ My opinion: During waking/active hours

# SureStep SMOs: Current Project

- ▶ Older (school-age) kids with Ds who are no longer using any type of orthosis
  - ▶ Must have been walking independently for 1 year or more
  - ▶ No orthopedic surgery or injury in last 6 months
  - ▶ No additional conditions (autism, seizures)
- ▶ Testing at University of Indianapolis
  - ▶ 3 times, approximately every 4 weeks
  - ▶ About 1 hour each session



# SureStep SMOs: Current Project

- ▶ Will be measuring:
  - ▶ Height, weight and selected joint range of motion (to assess for laxity)
  - ▶ Gross motor skills--such as walking on a line, single leg balance, running, jumping and stairs
  - ▶ Progress towards parent identified goals
- ▶ Measurements done in shoes only and in shoes + SureStep SMOs

# SureStep SMOs: Current Project

- ▶ Goal: determine if older children still gain some benefit from SureStep SMOs.
  - ▶ Most kids don't continue once they are walking well and have outgrown orthoses. Is this OK?
- ▶ SureStep SMOs provided at no cost to families but also no reimbursement for travel to UIndy for the data collection.



# SureStep SMOs: Current Project

- ▶ Results will be discussed at 3<sup>rd</sup> session and child will keep SureStep SMOs if we agree that they are helpful.
- ▶ Collaborating with Dr. Julia Looper, PT, PhD at the University of Puget Sound
  - ▶ To help get a larger sample size
- ▶ Ultimately we want this data to help support insurance reimbursement for SureSteps!





# Early Motor Development

- ▶ Dr. Karen Adolph—Developmental Psychologist
  - ▶ Research on motor development of typically developing children
  - ▶ Astounding data about the **MASSIVE** amount of practice children accumulate when learning a new skill
  - ▶ Has informed my perspective on intensity of practice needed!

# Early Motor Development

- ▶ Dr. Karen Adolph's work summarized:
- ▶ Typically developing toddlers accumulate
  - ▶ 2,000 steps and cover approximately 7 football fields PER WAKING HOUR!
  - ▶ Fall 15 times an hour when learning to walk
- ▶ If awake for ~ 8 hours a day: 16,000 steps, > 40 football fields, and > 100 falls!

# Early Motor Development: children with Down syndrome

- ▶ My hypothesis: children with Ds move less and thus get less practice
  - ▶ Accumulated motor skill practice has NOT been documented for children with Ds
- ▶ My research question: how much motor skill practice are young children with Ds accumulating while playing?



# Early Motor Development in Ds

## ► So what??

- If typical children require massive amounts of practice to master a skill, a child with Ds likely requires just as much if not more because of low muscle tone, ligamentous laxity, and longer time to learn.
- Physical therapists need to be helping parents identify opportunities to accumulate more practice
- Could we speed up motor development?

# Early Motor Development: Current Project

- ▶ Videotape a child playing for 10 minutes
- ▶ Code the motor activity on video
  - ▶ Time spent in static standing, sitting, or lying
  - ▶ Time spent in dynamic activities (moving vs. staying in one place)
  - ▶ Number of steps taken
  - ▶ Time spent in purposeful play vs. watching

# Early Motor Development: Current Project

- ▶ Children with Ds who
  - ▶ have been crawling on hands and knees for more than 6 months
  - ▶ Walking independently for less than 6 months
- ▶ In collaboration with Gigi's Playhouse Indy
  - ▶ Filming at their Castleton location
- ▶ Want to add a session filmed in home, too





# Early Motor Development: Current Project

- ▶ Physical Therapy students assisting with project
- ▶ Just beginning to scratch the surface for this question
- ▶ Early results: young children with Ds spent 90% of the 10 minutes of play in static positions
  - ▶ We need to change this!!!
  - ▶ Do kids move more in home environment?

# If you want more information...

- ▶ Email is best way to reach me: [kmartin@uindy.edu](mailto:kmartin@uindy.edu)
- ▶ Send questions – about my research or about the topics I have presented
- ▶ Request articles I mentioned



# How can you get involved?

- ▶ If your child meets the criteria for either of my 2 studies:
- ▶ Email: [kmartin@uindy.edu](mailto:kmartin@uindy.edu)
- ▶ Call: 317-788-2117





Thank you!

