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# New Paradigms in Pediatric Foot & Ankle Deformity Management – A 4-Day Course

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## Course Description

**LEVEL: INTERMEDIATE** – Precourse readings and review materials are assigned – Enrollees are expected to arrive prepared.

**TARGET AUDIENCE:** This course is designed for the practitioner who has experience in working with children with CNS neuromotor dysfunction, including physical therapists, orthotists, pediatric orthopedists, and physical medicine and rehabilitation physicians. We believe that team education fosters more effective teamwork.

The content covered in this program includes the following topics:

- The emerging sciences of postural control acquisition and maintenance, including the role of the somatosensory system as it is currently understood in relation to load-bearing alignment of the torso, lower limbs, and feet.
- Foot and ankle functional anatomy, biomechanics, development, and pathomechanics in relation to body weight orientation over the base of support and to designing orthotic modifications to optimize foot development and function.
- Body weight distribution on the foot and through load-bearing joints as a causative factor in contracture formation, early onset of pain, and degenerative joint disease.
- Muscle physiology and pathophysiology in the presence of chronic use of compensatory postural control mechanisms while distinguishing spasticity from connective-tissue contractility and muscle transformation.
- Skeletal modeling mechanisms underlying the process of use-related ankle and foot development.
- Characteristics of and factors contributing to healthy foot development.
- Elements of gait development that relate to and support foot development.
- The kinesiology and pathokinesiology related to - and in support of - the safe and effective use of below-knee casts and orthotic interventions designed to improve postural alignment and control and to reduce flexible foot and ankle deformities that commonly emerge in the presence of central nervous system dysfunction, hypotonia, and ligament laxity in childhood. Discussion of orthotic options includes Elaine Owen's Tuned AFO/Footwear Combinations, heel lifting and weight-line training, orthotic posting, and foot packaging principles and strategies.
- Hypoextensibility management is distinguished from the alteration of movement strategies, and includes discussions of interventions such as positioning, resting splints, manual stretching, neurolytics, and serial casting.

Common developmental foot deformities are identified and described in terms of plane-based anatomical components. Musculoskeletal assessment procedures are reviewed as the findings lead the clinician to a systematic clinical decision-making process regarding orthotic design to optimize load-bearing foot and limb joint alignment, the desired magnitude of segment enclosure, the degrees of freedom to be allowed, and posting options. Soft-tissue extensibility findings are also used in the documentation of the effects of assorted orthotic intervention strategies.

Labs feature closely-supervised trials of several ankle and foot assessment procedures, with findings applied to orthotic posting and design. Assessment tools and materials will be provided for undertaking posting trials to preview effects of proposed orthotic modifications.

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## Course Objectives

### **Participants completing the *didactic portion* of this course are expected to be able to:**

- Describe, in plane-based terminology, the motions of the joints and various bones of the foot in the open and closed kinetic/kinematic chains.
- Discuss the relationship between joint alignment and related muscle function in terms of joint axis inclination, muscle and loading force vectors, lever arms, and resultant moments.
- Describe the role of the foot and ankle sensory receptors and weight distribution on the foot in the achievement and maintenance of postural control in standing and gait.
- Explain the clinical rationale for using specific assessment techniques to identify features of soft tissue extensibility, joint mobility, and structural alignment in the ankle and foot.
- Discuss the reported reliability and validity of common clinical tests for spasticity.
- Distinguish between spasticity, connective-tissue contractility, and soft-tissue transformation, and discuss management implications.
- Discuss the physiology and functional significance of  $R_1$  (first-catch) end range of motion.
- Explain the physiologic and structural changes that are known to occur in chronically over-recruited muscle and surrounding tissues following a history of recruitment for maintenance of verticality.
- Distinguish between dominance and strength within a muscle force couple.
- Upon discovering a dominant muscle, name 3 related areas of concern.
- Describe orthotic posting in sagittal and frontal planes, and discuss posting objectives.
- Discuss the purposes of weight line training in foot and ankle deformity management re proprioception and muscle recruitment strategies used for postural control.
- Name 5 features that identify a sound developing foot.
- Identify the deformities of the foot and ankle that occur most commonly in children or adults with CNS upper neuromotor dysfunction, and describe the components of illustrated deformities at each joint in plane-based terms.
- Determine whether a deformity meets the criteria for intervention with heel-posting in ankle plantarflexion, serial casting, an R-wrap© orthosis, stretch splinting, and/or positioning.
- Explain the rationale for instituting strengthening and range-maintenance measures after restoring soft tissue extensibility.
- Discuss the limitations of stretching exercise as a deformity management tool.

Participants completing the ***lab sessions*** of this course are expected to be able to:

- Demonstrate novice skill level in musculoskeletal assessment procedures of the ankle and foot in

the open and closed chains.

- Bring the principles of orthotic posting to the findings obtained in assessment lab, and formulate an orthotic design plan.
- Demonstrate novice skill in undertaking an informed, targeted, temporary and exploratory posting trial.
- Participate in a workshop designed to generate ideas for promoting optimum body COM distribution over the feet in standing and walking.

## Program Schedule

### DAY 1: PART 1 - SEMINAR

8:15	Register and settle in.	2:00	Short Break
8:30	Review of Functional Foot Anatomy & Closed-Chain Function	2:15	Muscle Balance Theory – Application to Pediatric Foot Deformity Management
9:30	Standing Lab	3:15	Development & Assessment of Ankle DFROM
9:45	Break	3:45	Short Break
10:15	Kinematics Feed Kinetics – Ideal Ankle & Foot Function in Gait	4:00	Sagittal Plane Posting – Rationale & Strategies
11:15	The Role of Spasticity in Foot Deformity Development and Management	4:45	Videotaped Case - Max
12:00	Lunch	5:00	Questions & Discussion / Review of Planar Motions and Deviations
1:00	Postural Control Deficits and Contracture Formation - Are they Related?	5:15	Adjourn

### DAY 2: PART 1 – SEMINAR

8:30	Foot Assessments Overview	2:00	Short Break
9:00	Review of Pathomechanics & Posting Options	2:15	Hypoextensibility Management Strategies
10:00	Break	2:45	Name That Foot Deformity!
10:30	Orthotic Posting Options – continued	3:45	Short Break
11:00	Healthy Foot Development via Loading	4:00	Videotaped Case - Matthew
12:00	Lunch	5:00	Questions & Discussion
1:00	Features of Gait Development	5:15	Adjourn

*(Part 2 - Lab Participants - bring shorts tomorrow)*

### DAY 3: PART 1 (AM): SEMINAR

8:30	Serial Casting: Precautions, Contraindications, Limitations, and Guidelines	11:50	Questions & Discussion
9:15	Making Targeted Orthotic Design Decisions	12:00	Adjourn
10:00	Break	<i>Part 1 Attendees, please turn in evals.</i>	
10:30	Making Targeted Orthotic Design Decisions, continued	<i>Thank you, and safely home.</i>	
11:15	Videotaped Cases		

### DAY 3: PART 2 (PM): FOOT ASSESSMENTS LAB (BRING SHORTS OR STRETCHY PANTS TODAY)

1:00	<b>LAB:</b> Open-Chain Assessments – Foot Design & Joint Mobility <i>Break food available – no formal break</i>		
5:30	Clean up and adjourn		
			Lab contact hours: 4.50

### DAY 4: (BRING SHORTS OR STRETCHY PANTS AND SHOES WITH INSOLES TODAY)

8:30	<b>LAB:</b> Open-Chain Assessments – Foot Design and Joint Mobility – Repeat with a new partner <i>Break food available – no formal break</i>	2:00	<b>LAB:</b> Post your 2 <sup>nd</sup> partner's shoe insert using the findings.
11:00	<b>LAB:</b> Closed-Chain Foot Assessments	3:00	Pediatric Case Presentation – Foot & Ankle Assessment Demonstration & Posting Trial (if possible)
12:00	Lunch		
1:00	Posting Demonstration	5:00	Adjourn
Lab contact hours: 7.00			