



# Pediatric Neuromotor Rehabilitation

## Using Orthotic Modifications and TheraTogs Systems

Instructor: Beverly Cusick, PT, MS, C/NDT, COF

### **A 4-DAY PROGRAM IN 2 PARTS - LEVEL: INTERMEDIATE**

**PART 1: DIDACTIC SESSIONS – DAYS 1, 2, 3**

**PART 2: LABS – DAY 4 (*Limited Participant Enrollment – Others May Audit*)**

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## Course Description

The program features a review of skeletal modeling mechanisms and influences, followed by a detailed discussion of the developmental features of the trunk and lower extremity. The content pertains primarily to the body segments proximal to the foot. The instructor emphasizes the use of accurate nomenclature and plane-based views in the identification of characteristics of joint and postural alignment and bone and joint configuration.

Normal developmental events are related to:

1. The cardinal planes in which they occur
2. The process of physiologic adaptation of bone, soft tissues, and the sensorimotor cortex in the presence of a history of use and massed practice
3. Skeletal modeling errors in the presence of ligament laxity and premature birth without the skeletal alignment and motion constraints imposed by uterine confinement after full-term gestation
4. Somatosensory development and input in motor skills acquisition
5. Problems of postural control and distribution of the body center of mass in children with neuromotor disorders
6. Principles of Muscle Balance Theory as proposed by Shirley Sahrmann, PhD, PT
7. The role of the ankle and foot as the body-ground interface in standing and gait
8. Findings obtained by undertaking selected musculoskeletal assessments
9. Therapeutic management strategies featuring orthotic modifications to optimize somatosensory input through the feet, and the individualized use of the TheraTogs™ Orthotic Undergarment and Strapping System. The relevance of the findings obtained in the musculoskeletal assessment is made evident in videotaped case presentations.

On Day 4, lab participants will execute 6 musculoskeletal assessments under supervision. These participants will complete the program by observing 1 live case presentation (infant) and participating in a second, in which they will be asked at random to explain ongoing procedures, to try executing an assessment procedure, to don garments, or to apply a strap to the participating child and explain it's objective.

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## Course Objectives

### **Part 1 participants completing this course are expected to be able to:**

- Distinguish between strain and load, and apply this distinction to the skeletal modeling process.
- Describe the modeling effects of functional history of experiencing compression, tension, cantilever flexure, and loaded, torsional torque strains, and relate this information to intervention strategies.
- Assign alignment features of the torso, pelvis, and lower limb bones and joints to the cardinal planes.
- Identify these features of neonatal skeletal structure and joint alignment, kyphosis, increased femoral anteversion, increased medial femoral torsion, medial leg and foot rotation biases, tibiofibular torsion status, genu varum, and ankle valgus.
- Discuss the influences of normal neonatal soft tissue constraints on skeletal and motor development.
- Discuss the significance of the postural symmetry typically seen in supine and prone positions at age 4 months in the contexts of skeletal modeling, postural control acquisition, and limb use.
- Relate the status of trunk and head control to limb function.
- Locate the typical body center of mass in an infant, child, and adult.
- Describe a competent weight shift.
- Explain the kinematics and related kinetics of the 3 rockers and the swing-limb torque generator in gait.
- Discuss the role of the swing limb in modeling the long bones and foot of the stance limb in gait.
- Discuss massed practice in the acquisition of postural control and movement skills in normal development.
- Referring to the active and passive muscle length-tension relationships, differentiate between muscle dominance and muscle strength.
- Explain the principle of relative hypermobility in the presence of soft tissue contracture, and provide 2 examples.
- Explain the impact of Level 1 (basic) direction-specific postural responses on the development of common contractures in ambulatory children with cerebral palsy.
- Explain the objective of inserting a heel lift under a plantarflexed ankle in children with equinus deformity, and describe strategies for improving weight distribution and sensory input through the heels.

- Distinguish between anteversion and antetorsion of the femur, and explain the clinical significance of this distinction in terms of providing orthotically imposed lateral rotation across the hip joint.
- Distinguish between femoral medial rotation and excessive medial femoral torsion in swing and stance phases of gait.
- Describe the components of the thigh-foot angle, and relate the assessment findings to foot progression angle in gait.
- Relate the findings obtained by reviewing a battery of presented musculoskeletal assessments to:
  - Age-related, ideal findings
  - Modeling potential as it is currently understood
  - Postural and gait deviations
  - Foot segment loading
  - Orthotic modifications
  - If relevant, to the design of a live-in torso and joint realignment system
  - Construct a prioritized management plan – no more than 5 strategies - for the child.

**Participants completing the lab sessions on Day 4 are expected to be able to:**

- Acquire novice-level skill in executing 6 LE musculoskeletal assessment procedures; hip rotation in extension, Modified Ryder’s Test, hamstring muscle length test (R1), patella angle, thigh/foot angle, and passive Ankle DFROM with knee extended – R1 & R2.
- Either demonstrate Level I and II fitter certification skills in donning and doffing TheraTogs garments and strapping applied for postural alignment, changing weight loading, improving hip stability and functioning lower limb joint alignment, with principles of muscle balance theory and skeletal modeling prospects in mind.

OR

- Observing 2 case presentations, be prepared to execute one assessment procedure upon request, and explain the assessment procedures, the attention to orthoses where applicable, and the rationale supporting the use of TheraTogs garments and selected strapping strategies if appropriate.

# Course Schedule

## DAY 1

Start	Day 1	Hours
8:00	Register / Continental breakfast	
8:30	Introduction	.25
8:45	Skeletal Modeling Mechanisms - The Role of Movement in Shaping the Lower Extremities	.50
9:15	The Somatosensory System & Infant Body Design in Postural Control Development	.75
10:00	Break	.00
10:30	Common Postural Control Problems in Children with Neuromotor Disorders	.50
11:00	Sahrmann's Muscle Balance Theory - Management Implications	1.00
12:00	Lunch	.00
1:00	Developmental Events & Related Assessments - Sagittal Plane: Spine & Pelvic Alignment - Management Implications	.75
1:30	Videotaped Case Presentation	.25
2:00	Short break	00
2:15	Sagittal Plane Events / Assessments: Hip Flexion & Extension ROM - Management Implications	.50
3:00	Short Break	00
3:30	Sagittal-Plane Events / Assessments: Knee ROM, Hamstring Muscle Length, Patella Angle	1.50
4:30	Videotape: Patella Alta Taping Procedure	.25
4:45	<b>DEMO:</b> TheraTogs Garment Donning & Strapping for Postural Alignment in Standing Position, & for Hip Flexion & Extension Assist	.50
5:15	Questions / Discussion	00
5:30	Adjourn	Day 1 Didactic Contact Hours: 6.75

## DAY 2

Start	Day 2	Hours
8:00	Sign in / Continental breakfast	
8:15	Review of Ankle Function in Gait	1.00
9:15	Ankle DFROM – Assessment Procedures – Relevance of R1 End Range	1.00
10:15	Short Break	00
10:30	Ankle - Sagittal-Plane Orthotic “Tuning” Modifications	1.00
11:30	Videotaped Case Presentations: Axel & Max	.50
12:00	Lunch - <i>Adult-Sized TheraTogs available for Try-On from 12:30-12:55 today</i>	00
1:00	<b>DEMO:</b> TheraTogs Strapping for Sagittal-Plane Knee and Ankle Motions	.75
1:45	Developmental Events & Related Assessments- Frontal Plane: Weight-loading Asymmetry, Pelvic Obliquity, Leg Lengths, Hips & the ITB complex: Management Implications	.75
2:30	Short Break	00
2:45	<b>DEMO:</b> Toggling for Frontal-Plane Alignment & Stability & Unilateral Weight-Loading	.25
3:00	Using TheraTogs for the Pediatric Upper Extremity	.75
3:45	<b>DEMO:</b> Toggling for Upper Extremity Functioning Malalignments	.25
4:00	Short Break	00
4:15	Live-In Systems for Sensory Processing Disorders, Ataxia, & Autism Spectrum	.25
4:30	Videotaped case presentations – Chloe, Hannah	.75
5:15	Questions & Discussion	00
5:30	Adjourn	Day 2 Didactic Contact Hours:
		7.25

## DAY 3

Start	Day 3	Hours
8:00	Sign in / Continental breakfast	
8:15	<b>Lecture &amp; LAB</b> with props: Distinguishing Femoral Torsion from Version	.50
8:45	Developmental Events & Related Assessments -Transverse Plane: Pelvis, Hip & the ITB complex, & Femur	.50
9:15	Short Break	00
9:30	Assessing Femoral Torsion with Management Implications & Precautions	1:00
10:30	Short break	00
10:45	Developmental Events & Related Assessments -Transverse Plane: Knee & Leg	1.25
12:00	Lunch - <i>Adult-Sized TheraTogs available for Try-On from 12:30-12:55 today</i>	00
1:00	<b>DEMO:</b> Toggling to Address Transverse-Plane Problems at Pelvis & Lower Extremity	.50
1:30	Review and <b>DEMO:</b> Strategies for Positioning – Sitting, Prone, Sleep	.75
2:15	Short Break	00
2:30	<b>Clinical Application Demo</b> – Videotaped Case Study with a Review of Musculoskeletal Assessment Findings & Setting Management Goals	1.00
3:30	<p><b>LAB:</b> Clinical Application Workshop - Videotaped Case Study –</p> <ul style="list-style-type: none"> <li>• Participants categorize available musculoskeletal assessment findings</li> <li>• Identify treatment targets</li> <li>• Select and prioritize 3 to 5 management strategies.</li> <li>• Explain those choices.</li> </ul> <p><i>No formal break - Participants are to break for food or other essentials at will.</i></p>	1.25
4:45	Group Discussion of Workshop Results and Questions	.50
5:20	Please complete and turn in evals.	00
5:30	Adjourn - <span style="float: right;">Day 3 Didactic Contact Hours:</span>	5.50
	Day 3 Lab Contact Hours	1.75
	Days 1, 2, 3 Didactic Contact Hours:	19.50
	Total contact hours Days 1-3:	21.75

**DAY 4: LAB ENROLLEES COME DRESSED TO UNDERGO  
LE ASSESSMENTS REQUIRING PALPATION.**

Start	Day 4	Hours
8:00	Sign in / Continental breakfast	
8:15	<b>LAB:</b> Assessment Procedures: “Hip” Rotation ROM, Modified Ryder’s Test, Hamstring Length Test (R1). Participants work in groups of 3.	1.75
10:00	Short Break	00
10:15	<b>LAB:</b> Assessment Procedures: Patella Angle, Thigh/Foot Angle, Ankle DFROM. (In groups of 3.)	1.00
11:15	<b>LAB:</b> TheraTogs Try-On - Stages 2 (posture) & 3 (extremities)	1.25
12:30	Short Lunch on premises	00
13:15	TheraTogs Fitter Certification Labs – Levels I & II	4.00
<b>OR</b>		
13:15	<b>Case Presentation #1</b> – Assessment – Infant - (<age 12 months) with hypotonia or CP.	1.00
14:15	Short Break	00
14:30	<b>Case Presentation # 2</b> – Ambulatory child with CP– age 3 thru 7 yrs – GMFCS I, II, or III Participants engage in assessments, discussion, explanations upon Instructor’s request	2.75
17:15	Present Certificates of Completion	00
17:30	Adjourn - Pack up, Clean up if you can Contact Hours: <span style="float: right;">Day 4 Lab</span>	8.25
	Total Didactic Contact Hour - Days 1-4:	20.50
	Total Lab Contact Hours - Days 1-4:	9.25
	Total Contact Hours Days 1-4	29.75