



Developmental Orthopedics of the Trunk & Lower Extremity

A TWO-DAY Review of Operating Processes with Implications for Management

TARGET AUDIENCE: Rehabilitation team members, including physical therapists, occupational therapists, orthotists

LEVEL: INTERMEDIATE – Pre-course readings are assigned.

Course Description

This program features an overview of somatosensory function and development, the role of postural control in movement acquisition and physiologic adaptation, skeletal modeling mechanisms and influences, and ideal and pathomechanical features of orthopedic development of the trunk and lower extremity.

Normal developmental events are related to:

- The operations of the somatosensory system
- Postural control acquisition and body weight management
- Biomechanical influences of full-term gestation
- Functioning postural and limb joint alignment
- Elements of Sahrman's approach to analysis of the Movement System
- The process of physiologic adaptation of bone, soft tissues, and the sensorimotor cortex

Deformity development is discussed in relation to:

- Spasticity
- Ligament laxity
- Premature birth
- Movement strategies in the presence of inadequate postural control and innate righting reactions
- Use history in postural malalignment
- Skeletal modeling errors

Management strategies are related to:

- Body weight distribution onto the functioning base of support
- Functioning joint alignment and related muscle lengths
- Weakness
- Skeletal modeling potential
- Musculoskeletal assessment findings.

Instructor describes selected musculoskeletal assessments and the implications of their findings, and brings them to therapeutic and orthotic management planning designed to optimize bone and joint development via movement. The relevance of the findings obtained in the musculoskeletal assessment to target selected interventions is made evident in videotaped cases.

Course Objectives

Participants completing this course are expected to be able to:

- Describe these features of normal, postnatal immaturity of skeletal structure and alignment: thoracolumbar kyphosis, hip flexion contracture, increased femoral anteversion, increased femoral antetorsion, coxa valga, genu varum, and medial thigh-foot angle.
- Distinguish between strain and load and apply this distinction to the skeletal modeling process and to modeling potential in an aging child.
- Discuss the sources and the significance of the achievement of bilateral, symmetrical, antigravity neck and trunk extension by age 4 months.
- Explain the presence of symmetry in supine and prone positions at age 4 months as evidence of fundamental postural control.
- Describe how the normal neonatal hip flexion contracture influences the early modeling of the spine in the sagittal plane.
- Relate ideal, full-term neonatal posture and lower limb joint alignment to postural control acquisition in prone, supine, sitting, and standing positions.
- Relate ideal, full-term neonatal posture and lower limb joint alignment to the acquisition of skilled transitions between quadruped and sitting positions.
- Describe the typical progression from postural control acquisition to movement acquisition in sequential play postures and relate this progression to neuromotor re-education.
- Relate the achievement of competent weight shifting in the frontal plane to emerging limb use.
- Differentiate between femoral anteversion and femoral antetorsion and explain the relevance of the distinction to the safe use of orthotic interventions.
- Explain why measurements of “hip” medial and lateral rotation range of motion (ROM) do not represent hip joint motions.
- Describe the anatomical components of the thigh-foot angle and its typical developmental progression.
- Describe the apparent relationship between postural control status and limb muscle extensibility.
- Give an example of normal massed practice.
- Explain the relationship between frontal-plane weight shift skill, the swing limb torque generator in gait, and long bone torsion reduction in the lower extremities.
- Explain the potential impact of Level 1 (basic) direction-specific postural responses on the development of common contractures in ambulatory children with diplegic cerebral palsy.
- Explain the potential somatosensory and therapeutic benefits of optimizing the postural base of support and functioning joint alignments in daily life.

Program Schedule

Day 1

| Start | Topic | Contact Hours |
|-------|---|---------------|
| 8:45 | Register and settle in | — |
| 9:00 | An Overview of Developmental Changes in the Spine and Lower Extremities | .50 |
| 9:30 | Strain and Load: Shaping Bones and Joints with Skeletal Modeling | 1.00 |

Day 1

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|-------|--|------------------------------|
| 10:30 | Break | — |
| 11:00 | Proximal Before Distal: The Contributions of Postural Control Acquisition & Maintenance to Orthopedic & Neuromotor Development | 1.25 |
| 12:15 | Lunch | — |
| 1:30 | Biomechanical Advantages of Full-Term Gestation | 1.25 |
| 2:45 | Short break – 15 minutes | — |
| 3:00 | Body Weight Distribution in Neuromotor & Orthopedic Development | 1.00 |
| 4:00 | Ideal Lower Limb Soft-Tissue Extensibility - Evidence of Use History | .50 |
| 4:30 | Short Break – 15 minutes | — |
| 4:45 | Ideal Lower Limb Soft-Tissue Extensibility - continued | .50 |
| 5:00 | The Role of Postural Control Deficits in Deformity Development | .75 |
| 5:45 | Questions and Discussion | .25 |
| 6:00 | Adjourn | Didactic Contact Hours: 7.00 |

Day 2

| Start | Topic | Contact Hours |
|-------|--|------------------------------|
| 8:00 | Arrive and settle in | — |
| 8:15 | Clarifying Femoral Torsion and Version | .50 |
| 8:45 | Developmental Changes in the Pelvis & Femur in the Transverse Plane | 1.00 |
| 9:45 | Break | — |
| 10:15 | Developmental Changes in “Hip” Rotation ROM – Clinical Implications | .50 |
| 10:45 | Assessing “Hip” Rotation Range of Motion (ROM) | .50 |
| 11:15 | Assessing Femoral Torsion | .75 |
| 12:00 | Lunch | — |
| 1:00 | Clinical Implications of Transverse-Plane Hip and Femur Findings | .75 |
| 1:45 | Videotaped Case | .50 |
| 2:15 | Short break – 15 minutes – no food | — |
| 2:30 | Developmental Changes in the Knee, Leg, & Foot in the Transverse Plane - | 1.00 |
| 3:30 | Short Break – 15 minutes – grab a snack | — |
| 3:45 | Clinical Implications of Transverse-Plane Knee & Leg Findings | .50 |
| 4:15 | Associating Foot Alignment with Orthopedic Development in Diplegic CP | .75 |
| 5:00 | Questions and Discussion | .25 |
| 5:15 | Adjourn | Didactic Contact Hours: 7.00 |

Beverly Cusick, PT, MS, NDT, COF - Summary Biography

EDUCATION:

- 1972 - BS in PT from Bouve College at Northeastern University (Boston) in 1972, summa cum laude.
- 1988 - MS in Clinical and College Teaching for Allied Health Professionals - University of Kentucky.

WORK EXPERIENCE:

- 1 year – PT staff at (now) Spaulding Rehabilitation Center, Boston, MA
- 3 years – PT staff and Director for UCP Center, Lawrence, MA
- 9 years - PT staff at Children's Rehab. Center (now, Kluge Center), Charlottesville, VA.
- 3 years - PT Education faculty, College of Health-Related Professions at Medical university of South Carolina (MUSC), Charleston, SC, and Director of PT Services for the Division of Developmental Disabilities at MUSC.
- 1 year, consultant, Cardinal Hill Hospital's Head Trauma & Pediatrics teams – Lexington, KY.
- 4 years, assisting in the PT Department at Children's Hospital at Stanford, Palo Alto, CA.
- 31 years in private practice.

PUBLICATIONS:

- Help Patients Manage Equinus Deformity. *O&P Business News*, 2011; April: 74-77.
- Orthotic Management of Low-Toned Children: The Earlier the Better. (Co-author). *O&P Edge*. 2011; Apr: pp. 24-29.
- *Serial Casting and Other Equinus Deformity Management Strategies for Children and Adults with CNS Dysfunction*. 2010. Published by Progressive GaitWays.
- *Foot Talk*. 2009. A DVD of a 2-hour lecture on functional foot anatomy and closed chain biomechanics, accompanied by a CD with a set of Power Point handouts of the same lecture.
- *Serial Casting for the Restoration of Soft Tissue Extensibility in the Ankle and Foot (2007 and 2009)*.
- *Legs & Feet: A Review of Musculoskeletal Assessments (1997, revised 2015)*, an instructional DVD.
- *Lower Extremity Developmental Features*. 2000. A home study monograph for the APTA's Orthopedic Section.
- *Progressive Casting and Splinting for Lower Extremity Deformity in Children with Neuromotor Dysfunction* 1990. Published by Therapy Skill Builders.
- Several textbook chapters, articles for journals, conference proceedings, and professional newsletters, including a series (2006 and 2007) on Pediatric Orthopedics for the *NDTA Network*.

CLINICAL TEACHING:

Guest lecturer for annual conferences of the APTA, the NDTA, and the American Academy of CP and Developmental Medicine, in the US and Canada; the British Association of Prosthetists and Orthotists; and the American Academy of Orthotics and Prosthetics, and the American Orthotic and Prosthetic Association.

Instructor of more than 460 courses, by invitation only, in 18 countries (Poland makes that 19).

Associate Professor for the Rocky Mountain University of Health Professions – Pediatrics Program – Provo, Utah, 2006 to present.

Since 1993 Ms. Cusick has been consulting and practicing privately in Telluride, Colorado. There, she devotes most of her professional effort to generating literature and educational materials, to teaching, and to developing therapeutic products, including her invention, TheraTogs orthotic systems.

A curriculum vita is available upon request.