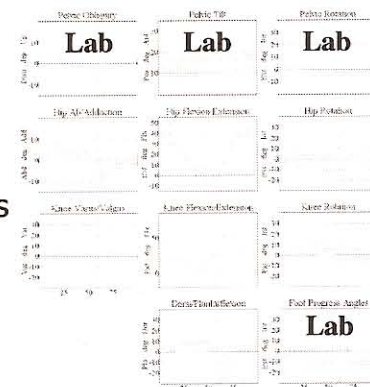


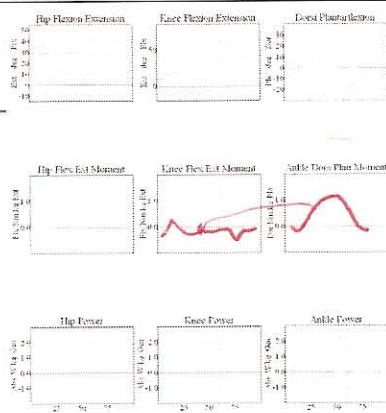
Common Pathological Patterns

- Tom F. Novacheck, MD
- Director, Center for Gait and Motion Analysis Gillette Children's Specialty Healthcare
- St. Paul, MN, USA

Normal Kinematics

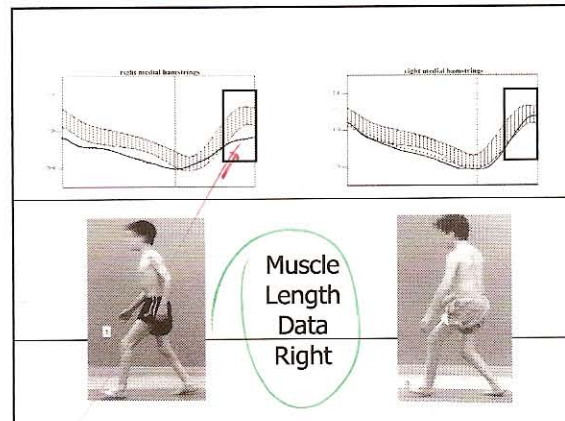
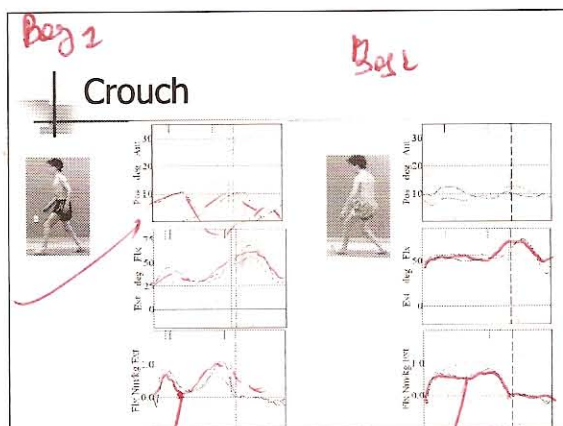
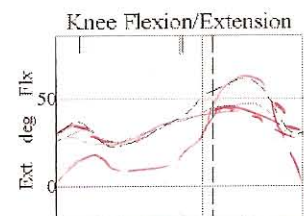


Normal Kinetics



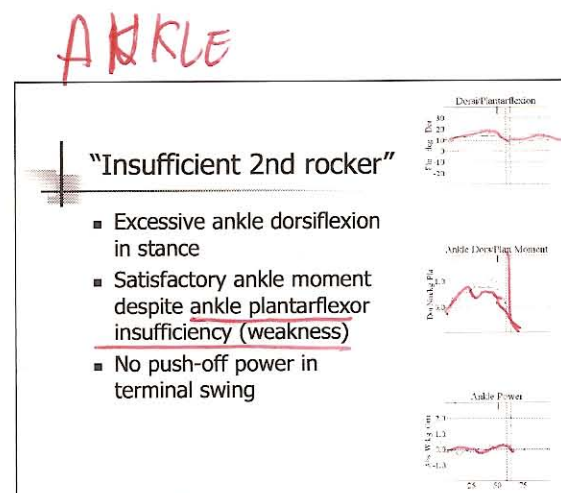
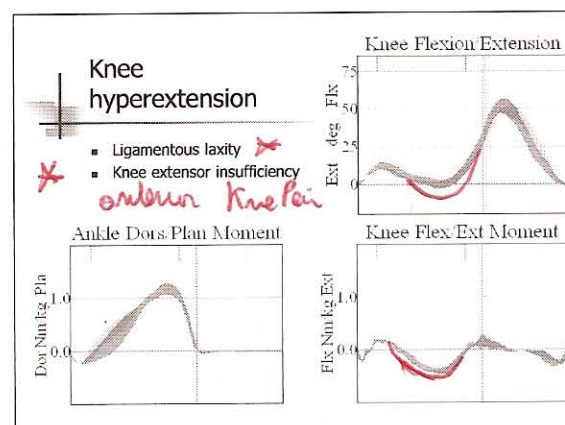
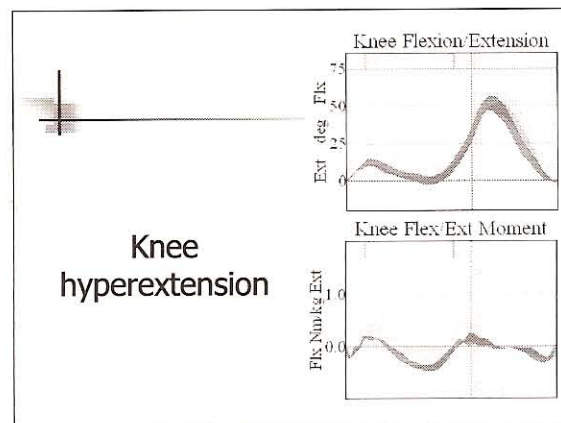
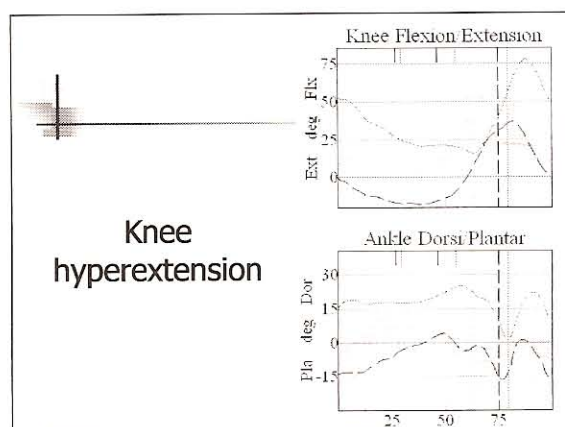
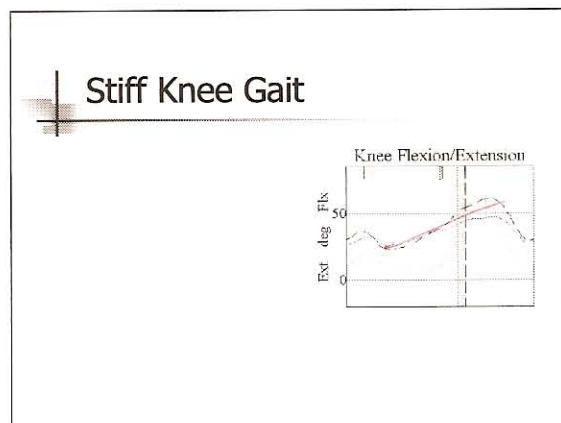
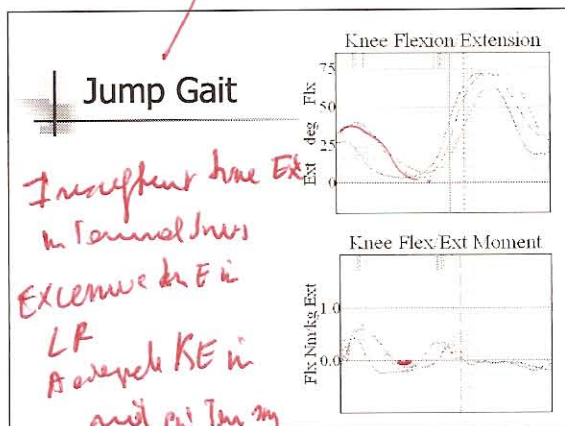
Crouch Kinematics

- Lack of knee extension terminal swing
- excessive knee flexion in stance @ IC, MS, TS
- Other
 - pelvic tilt -- posterior vs. anterior?
 - Ankle -- equinus vs. excessive dorsiflexion



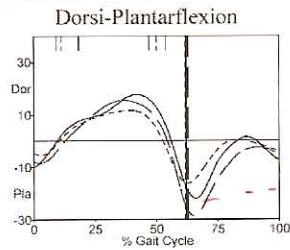
Medial Hsr very short

knee extension in stance



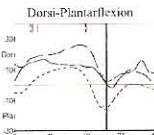
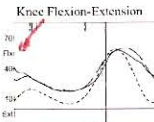
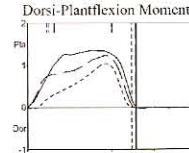
Equinus ankle patterns

- Drop foot in swing



Equinus ankle patterns

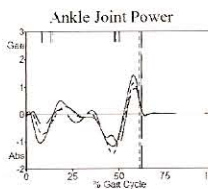
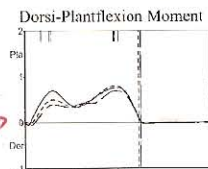
- "Single Bump Ankle"
- But, excessive ankle dorsiflexion



Pelvis and Hip

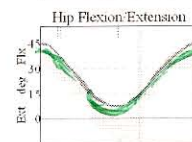
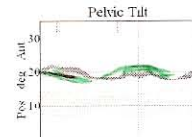
Equinus ankle patterns

- "double bump" ankle moment
- Inappropriate midstance power generation



Anterior Pelvic Tilt

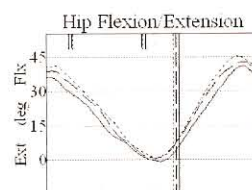
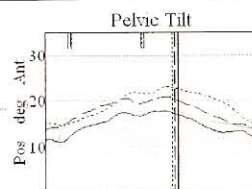
- Weakness
 - Hip extensors
 - Abdominals
- Hip flexor tightness
- Postural
- Compensation for equinus



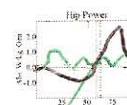
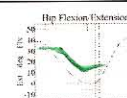
Hip flexion shock line

Single bump pelvic pattern

- Common in hemiplegia
- Hip flexor
 - tightness
 - contracture

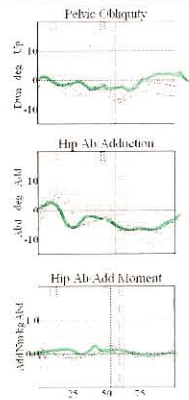


Hip extensor moment pattern



hip lower flex

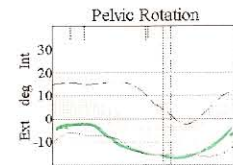
Hip abductor avoidance moment pattern



Pelvic malrotation

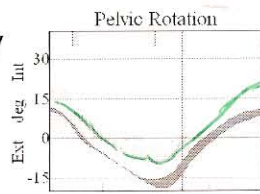
- Numerous causes

*CP Hip Repr
CP T12/13
Asymmetric femoral
Torsion.*



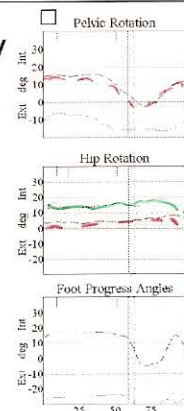
Increased pelvic rotation ROM

- Typically compensatory
 - Shortened step length
 - Inadequate sagittal plane motion
 - Insufficient power production



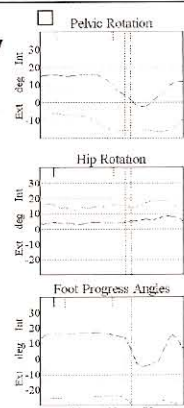
Internally/externally rotated foot

- Pelvic malrotation
 - L internal
 - R external
- Hip rotation
 - R internal
- Foot progression angle
 - L internal
 - R external



Internally/externally rotated foot

- Pelvic malrotation - 10°
 - Neurological asymmetry?
 - Unilateral R femoral anteversion?
- Foot progression
 - Left
 - 15° further internal
 - Internal tibial torsion vs. adducted foot
 - Right
 - 15° further external
 - External tibial torsion vs. abducted foot



Hemiplegic Patterns

