

# Moving Forward With the Movement System: Let's Work Together

Gammon Earhart, PT, PhD  
Stephen McDavitt, PT, DPT, MS, FAAOMPT  
Christopher Powers, PT, PhD, FACSM, FAPTA  
Lisa Saladin, PT, PhD, FAPTA, FASAHP  
Patricia Scheets, PT, DPT, MHS, NCS



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## Learning Objectives:

1. Understand the concept of the movement system as an identity for the profession.
2. Identify strategies for implementing the movement system concept into education, research, and orthopedic or neurological practice.
3. Describe methods for teaching and performing movement analysis.
4. Understand processes to be used in faculty development and curricular design for implementation of the movement system into an educational program.



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## Movement System: Introduction and Update

Lisa Saladin, PT, PhD, FAPTA, FASAHP  
Interim Provost and Professor  
Medical University of South Carolina  
and  
APTA Vice President and Movement System Task Force Chair



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## 2011 HOD Charge to the BOD

“...review and revise its current APTA Vision Sentence for Physical Therapy 2020 ... to reflect the vision of the profession of physical therapy and **its commitment to society beyond 2020.**”



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## APTA Vision Statement

Transforming society  
by optimizing movement  
to improve the human experience

Adopted by APTA HOD 2013

[www.apta.org/Vision](http://www.apta.org/Vision)



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## Guiding Principles

- Identity
- Quality
- Collaboration
- Value
- Innovation
- Consumer centered
- Access/equity
- Advocacy



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## Vision Principle; Identity

The physical therapy profession will define and promote the movement system as the foundation for optimizing movement to improve the health of society. Recognition and validation of the movement system is essential to understand the structure, function, and potential of the human body. The physical therapist will be responsible for evaluating and managing an individual's movement system across the lifespan to promote optimal development; diagnose impairments, activity limitations, and participation restrictions; and provide interventions targeted at preventing or ameliorating activity limitations and participation restrictions. The movement system is the core of physical therapist practice, education, and research.



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## Historical Calls for the Movement System as our Body of Knowledge

- Florence Kendall emphasized the importance of the profession establishing a relationship with a system of the body (McMillan, 1980).
- The Rose Garden Group (Delitto, Irwin, Gossman, Guccione, Zadai, Sahrman, Burkardt, Kigin, Michels, and others) recommended that the profession promote the development of the movement system (1990).
- Diagnosis Dialogue Conference Outcome: Movement System is the fundamental system associated with physical therapy (2006).



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## Why Label the Human Movement System as our Identity?

- “Physical therapy today is in the midst of a crisis of identity.”
- “We must ask ourselves if in our attempt to develop in multiple directions we have assumed a cloak of unidentifiability”.

Hislop, H.J. (1975). Tenth Mary McMillan Lecture. The not-so-impossible dream. *Physical Therapy*, Oct,55(10), 1069-80.



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“The identity crisis Hislop saw a decade ago has worsened. We, as a profession, may be doing more things, but in no way have we developed a true sense of who and what we are. All too often, we are defined by the tasks we do, and, as a result, only those who have seen therapists in practice have the vaguest notion of who and what we are.”

Rothstein, J.M. (1986). Pathokinesiology-A Name for Our Times? *Physical Therapy*, 66, 364-



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### 2017: External Perceptions of our Identity

Top definitions of physical therapy in order as they appeared in a google search.

#### Yahoo Dictionary

“The treatment of physical dysfunction or injury by the use of therapeutic exercise and the application of modalities, intended to restore or facilitate normal function or development”



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### 2017: External Perceptions of our Identity

Merriam-Webster

Therapy for the preservation, enhancement, or restoration of movement and physical function impaired or threatened by disability, injury, or disease that utilizes therapeutic exercise, physical modalities (as massage and electrotherapy), assistive devices, and patient education and training—called also *physiotherapy*



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**2017: External Perceptions of our Identity**

<http://www.simpletherapy.com/>

**“Your Anytime Alternative to Physical Therapy; Created by Doctors, Customized for You”**



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**2017: External Perceptions of our Identity**

[http://www.diffen.com/difference/Chiropractor\\_vs\\_Physical\\_Therapist](http://www.diffen.com/difference/Chiropractor_vs_Physical_Therapist)

“A **chiropractor** is a professional who is engaged in the diagnosis and treatment of mechanical disorders of the musculoskeletal system, whereas a **physical therapist** (also called physiotherapist) is a medical professional who provides treatment in case of injury, disease or caused due to aging, to assist and restore mobility and function.”



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**Physical Therapy: Our 2017 Identity**

- A health profession not defined by the techniques we use but by what we know.
- The movement system is the foundation of our practice, education and research.



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## Why?

- Unify the profession by re-claiming our value as experts in movement analysis/task analysis.
- Identify the root cause of movement dysfunction and target treatment there instead of targeting signs and symptoms.
- Refocus on the integration of examination and interventions across systems.
- Reduce unwarranted variation in practice and enhance the value of our profession.
- Become known for what we know and not for the techniques we perform.




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## APTA Action Steps: A 3 year Journey

- APTA Movement System Task Force I
  - Defined movement system and physical therapist practice in the context of the movement system (approved by BOD)
  - White paper posted on the APTA web site
  - Presentations at CSM and NEXT 2014, and 2015
  - Developed a draft plan for the integration of the movement system into education, practice and research
  - Report to the 2015 House of Delegates




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## The Journey continued

- APTA Movement System Task Force II
  - Revised definition of the movement system (approved by BOD)
  - Adopted a new diagram to represent the concept
  - Refined draft plan for the integration of the movement system into education, practice and research
  - Summit
- APTA BOD and Staff
  - Integrated the movement system in the strategic plan (summit, communications etc.)
  - Aligned resources to support the activities related to the movement system
- APTA Components




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## So what is the Human Movement System?

Definition:

The "movement system" represents the collection of systems (cardiovascular, pulmonary, endocrine, integumentary, nervous, and musculoskeletal) that interact to move the body or its component parts.



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## Physical Therapist Practice and The Movement System

Human movement is a complex behavior within a specific context.

- Physical Therapists provide a unique perspective on purposeful, precise and efficient movement across the lifespan based upon the synthesis of their distinctive knowledge of the movement system and expertise in mobility and locomotion.
- Physical therapists examine and evaluate the movement system (including diagnosis and prognosis) to provide a customized and integrated plan of care to achieve the individual's goal directed outcomes.
- Physical therapists maximize an individual's ability to engage with and respond to their environment using movement related interventions to optimize functional capacity and performance.



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## APTA Movement System Summit Summary and Outcomes



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## Important Note

- The APTA has absolutely no intention of adopting, endorsing or supporting any single therapeutic approach or diagnostic classification system related to the movement system.
- We welcome scientific discovery and the progression of this concept from all stakeholders.

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**Moving Forward With the Movement System: Let's Work Together**

Patricia L. Scheets, PT, DPT, NCS

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**Disclosure**

- I have no conflict of interest disclosures

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**The Great Dilemma**

Who hooks the leg?

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### Which Big Approach?

- Remediation
  - Return to previous strategies for previous activities
  - Maximum flexibility, consistency, efficiency
- Compensatory Movement Strategies
  - New strategies for previous activities
  - May see reduction in activities
  - Diminished flexibility, consistency, and/or efficiency
  - Associated with secondary musculoskeletal problems

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### 1 Health Condition – No Pattern



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### 3 Health Conditions – 1 Pattern



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## Building a Set of Diagnoses








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**Table of Contents**

- Cardiopulmonary Conditions
- Integumentary Conditions
- Musculoskeletal Conditions
- Neuromuscular Conditions
  - Movement Pattern Coordination Deficit
  - Force Production Deficit
    - Secondary Musculoskeletal Diagnoses
  - Fractionated Movement Deficit
    - Secondary Musculoskeletal Diagnoses
  - Postural Vertical Deficit
  - Sensory Selection and Weighting Deficit
  - Sensory Detection Deficit
    - Secondary Integumentary Diagnoses
  - Hypokinesia
    - Secondary Musculoskeletal Diagnoses
  - Dysmetria





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**DIAGNOSIS: FORCE PRODUCTION DEFICIT**

The primary movement fault is weakness. The origin of the weakness may be muscle, neuromuscular junction, peripheral nerve, or central nervous system dysfunction. The presentation may be focal (one joint), segmental (generalized to an extremity or body region), or related to fatigue (of skeletal muscle rather than autoglycogen capacity).

Subjective/Medical History	Key Tests and Signs	Associated Signs	Differential Movement System Dx	Expected Outcome
<p><b>Associated Conditions:</b></p> <ul style="list-style-type: none"> <li>• Good potential for <b>Impairment/Recovery</b></li> <li>• Generalized deconditionation</li> <li>• Disuse atrophy</li> <li>• Peripheral nerve conduction</li> <li>• Guillain Barre Syndrome</li> <li>• Stroke (rare)</li> <li>• Reiter injury</li> </ul>	<p><b>Strength:</b></p> <ul style="list-style-type: none"> <li>• Less than 3+5 to 4/5 muscle strength throughout a limb or limbs</li> <li>• Difficulty moving through full range against gravity</li> <li>• Focal weakness at one primary joint</li> <li>• Deterioration in range of</li> </ul>	<p><b>Movements:</b></p> <ul style="list-style-type: none"> <li>• Fractionated if present</li> </ul> <p><b>Muscle Tone:</b></p> <ul style="list-style-type: none"> <li>• Normal or mild hyperexcitability, mild hypotonicity or flaccid, mild rigidity</li> <li>• Grades 0-2 on the modified Ashworth</li> </ul>	<ul style="list-style-type: none"> <li>• Movement Pattern</li> <li>• Coordination Deficit</li> <li>• Hypokinesia</li> </ul>	<p><b>Good potential for Impairment/Recovery</b></p> <ul style="list-style-type: none"> <li>• Stable with standing ADL tasks</li> <li>• Independent ambulation in home and community (at least in familiar environments)</li> <li>• Ambulate without device or with cane at most (may need AFO)</li> </ul>





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## Fractionated Movement Deficit



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**DIAGNOSIS: MOVEMENT PATTERN COORDINATION DEFICIT**

The primary movement dysfunction is the inability to coordinate an intersegmental task because of a deficit in timing and sequencing of one segment in relationship to another. The movement dysfunction in the lower extremity is primarily observed during postural control tasks and in the upper extremity during in hand coordination tasks. The timing and sequence of different objects created with reach. Motor performance typically improves with practice and instruction.

Subjective/Medical History	Key Tests and Signs	Associated Signs	Differential Movement	Expected Outcome
<b>Associated Conditions</b> • Stroke (cereb) • Multiple Sclerosis (metabolic) • Parkinson's Disease (metabolic) • Generalized debility • Multi-sensory • gait/balance disturbance • sp-LT anomaly • BPN with postural instability • Down Syndrome • Muscular Dystrophy • Phenylketonuria • Epilepsy • Developmental Coordination Disorder • Autism Spectrum Disorder • Prematurity • Developmental Delay • Fragile X • Idiopathic Toe Walking • Motor Apraxia • Cerebellar Ataxia (Dysmetria) • Feet unusually, possible fall • Fear of falling • Clonus • Occasional falls • Daily in-line motor tasks • Clumsy messy when	<b>Task Analysis</b> • In 3-D • Altered sequence of movement components during execution usually significant COF of gait heel • Motor heavy at ankle • Heavy step at transition • Unable to require • Motor physical resistance • Abnormal Translational Mot: stability and task of ability when executing translational movements appropriate to age (or adjusted age) • Cost:	<b>Movement</b> • Generally fractionated movement against gravity throughout • Normal or mild hypermobility, mild rigidity • Usable of 0-2 on modified Ashworth <b>Sensation</b> • Normal or no more than mild loss of JPS at great toe or ankle in UE • Normal or no more than mild loss of vibratory or numbness in UE <b>Non-equilibrium Coordination</b> • Normal or mild (p) moderate ataxia with reciprocal and synergistic movement • Normal or mild ataxia with tests of accuracy	<b>Excludes Dx</b> • Force Production Deficit • Sensory Deficit and Weighting Deficit • Sensory Intensity Deficit • Dysmetria • Force Production Deficit • Sensory Deficit and Weighting Deficit • Sensory Intensity Deficit • Dysmetria	• Stable with standing ADL tasks • Independent ambulation in home and community (at least in familiar environments) • Ambulate without device or with cane if need may need an AFO but unlikely • Ascend/descend stairs reciprocally • Gait speed at least 75% of normal for age

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## Clinical Examination

- Looking for a diagnosis rather than activity limitations or problems
  - Pattern recognition
  - Testing the movement system
  - Diagnosis based on collection of test results

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### Clinical Examination

- Tests of Impairments
  - “Special tests”
  - Traditional tests
    - Motor
    - Sensory
- Task Analysis

Which is first?

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### Diagnostic Tasks

- Quiet Sitting
- Sit to/from Stand
- Quiet Standing
- Standing Feet Together
- Step-Up
- Walking
- Complex Walking
- Reach
- Grasp
- In-hand Manipulation

J Neurol Phys Ther. 2015 Apr;39(2):119-26

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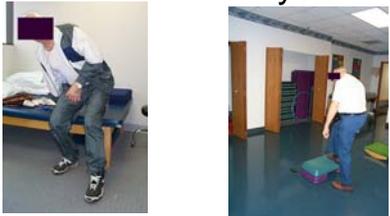
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### Movement Analysis



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## Phases of Movement

- **Initiation**
  - those changes that occur in order to overcome inertia of the body at rest
- **Execution**
  - intersegmental movements that allow for the movement of COM into a new position
- **Termination**
  - those changes that occur to decelerate the movement of the COM as the body stabilizes into a new position





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## Testing Procedures

- Ask the patient to hold position or complete the task
- Observe the first attempt and note presence or absence of *essential movement components*
- Give the patient cues and manual guidance to assist with missing components
- Repeat and note changes in performance





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Quiet Standing	
Observation	Interpretation
hesitation or multiple efforts to assume position; improves with practice	Movement Pattern Coordination Deficit
gross abnormality; COM shifted toward limits of stability	Biomechanical Deficit (modifier)
unable to stand unsupported; appears weak; would fall without support	Force Production Deficit
shifts COM away from midline; resists correction	Postural Vertical Deficit
increased sway with eyes closed; improves with practice	Movement Pattern Coordination Deficit
increased sway with eyes closed or loss of balance; no change with practice under this condition	Sensory Detection Deficit
loss of balance in a consistent direction; much increase in sway with eyes closed; improves with a visual target	Sensory Selection and Weighting Deficit
unable to maintain alignment at one or two segments; may appear worse the longer the patient attempts to stand	Force Production Deficit
excessive sway at trunk/hips; repeated stepping to maintain balance	Dysmetria





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Step-up	Observation	Interpretation
Initiation	hesitation and/or multiple starts before moving a foot; improves with practice	Movement Pattern Coordination Deficit
	hesitation and/or multiple starts before moving a foot; no consistent improvement with practice	Hypokinesia
Execution	circumduction of swing limb	Force Production Deficit
	increased movement time of swing limb; insufficient hip flexion	Fractionated Movement Deficit
	range of motion; stereotypic pattern; no improvement with practice	Movement Pattern Coordination Deficit
	lateral trunk flexion toward stance limb; improves with practice	Force Production Deficit
	lateral trunk flexion toward stance limb; may improve initially but then deteriorates with repetition	Force Production Deficit
	hip flexion of stance limb	Force Production Deficit
	hip drop of stance limb	Force Production Deficit
Termination	lateral trunk flexion toward swing limb	Force Production Deficit
	hyperextension of knees on stance limb	Force Production Deficit Sensory Detection Deficit
	loss of balance in a consistent direction; improvement with a visual target	Sensory Selection and Weighting Deficit
	posterior sway of stance limb; improves with practice	Movement Pattern Coordination Deficit
	excessive sway at turn-of-hips; may overshoot feet placement on step; repeated stepping to maintain balance	Dysmetria




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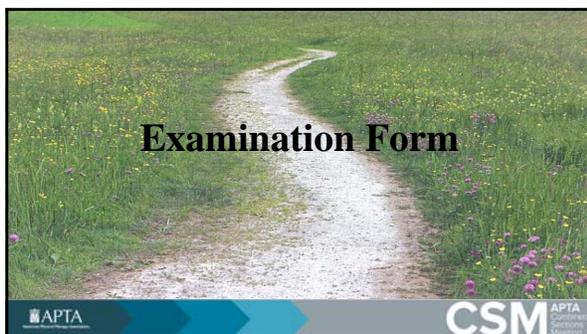
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### Sit to Stand Example

<b>Sit to Stand</b>		Assistance (circle): Ind (7) Adapted Ind (6) Sup (5) Min (4) Mod (3) Max (2) Total (1)	
<input type="checkbox"/> Without UE support	Surface height: _____	Assistance (circle): Ind (7) Adapted Ind (6) Sup (5) Min (4) Mod (3) Max (2) Total (1)	
<input type="checkbox"/> With UE support	Surface height: _____		
<b>Analysis: (check all that apply)</b>			
<input type="checkbox"/> Essential movement components present	<input type="checkbox"/> Decreased weight bearing	<input type="checkbox"/> Excessive pronation of foot	
<input type="checkbox"/> Unable to assume normal starting position, stiffness	<input type="checkbox"/> Shifts center of mass to one side	<input type="checkbox"/> Supination of foot	
<input type="checkbox"/> Absent preparatory movements	<input type="checkbox"/> Shifts COM to one side or back; resists correction	<input type="checkbox"/> Other _____	
<input type="checkbox"/> Unable to modify movement strategy with cue/practice	<input type="checkbox"/> Medial hip rotation / hip adduction	<b>TERMINATION</b>	
<input type="checkbox"/> Other _____	<input type="checkbox"/> Extends knees before hips in first half	<input type="checkbox"/> Posterior sway	
<b>INITIATION</b>	<input type="checkbox"/> Insufficient anterior translation of tibia over foot	<input type="checkbox"/> Steps	
<input type="checkbox"/> Increased base of support	<input type="checkbox"/> Pushes on thighs to extend trunk	<input type="checkbox"/> Shifts COM to one side	
<input type="checkbox"/> Insufficient force production	<input type="checkbox"/> Valgus of knee	<input type="checkbox"/> Shifts COM to one side or back; resists correction	
<input type="checkbox"/> Other _____	<input type="checkbox"/> Varus of knee	<input type="checkbox"/> Increased lumbar extension	
		<input type="checkbox"/> Inadequate hip extension	
		<input type="checkbox"/> Inadequate knee extension	

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### Standing Balance Example

<b>Analysis: (check all that apply)</b>		
<input type="checkbox"/> Structural alignment faults (scoliosis, kyphosis, etc)	<input type="checkbox"/> Shifts COM away from midline; resists correction	<input type="checkbox"/> Insufficient hip flexion on rising (not for start)
<input type="checkbox"/> Prefers wide base of support	<input type="checkbox"/> Hesitation when changing BOS or initiating movement	<input type="checkbox"/> Loss of balance; steps to recover
<input type="checkbox"/> Increased sway	<input type="checkbox"/> Multiple starts when changing BOS or initiating movement	<input type="checkbox"/> Loss of balance; needs to be caught to prevent a fall
<input type="checkbox"/> Increased sway with eyes closed	<input type="checkbox"/> Insufficient hip/knee extension during sit to stand	<input type="checkbox"/> Unable to modify movement strategy
<input type="checkbox"/> Attention to eyes closed condition		<input type="checkbox"/> Cue to modify movement strategy
<input type="checkbox"/> UE guarding or reaching		<input type="checkbox"/> Other _____
<input type="checkbox"/> Modified left / right / back		

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### Practice Case

**Practice Patterns: Gone**  
 Musculoskeletal (Patterns 4A-4J)  
 Neuromuscular (Patterns 5A-5I)  
 Cardiovascular/Pulmonary (Patterns 6A-6J)  
 Integumentary (Patterns 7A-7E)

SUBJECT:  
PHYSICAL THERAPIST PRACTICE

**Diagnostic Process :** Used by physical therapists that defines **which elements of the movement system contribute to deficits in capacity or performance that become the focus of the plan of care.**

Stephen McDavitt PT DPT MS  
 Fellow, American Academy of Orthopaedic Manual Physical Therapists  
 Catherine Worthingham Fellow, American Physical Therapy Association

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### Examination

- **General Information:**
  - **History:** 76 y.o. male admitted for this episode of care (10/2016) for addressing and managing complaints of low back and right buttock pain limiting standing, walking, bending, carrying and pushing/pulling.
  - **S/P lumbar laminectomy for decompression L3/4-L4/5 June 2016.**

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### Examination

- **ICD-10**
  - **M54.5: Low Back Pain**
  - **M48.06: Spinal Stenosis, Lumbar Region**
  - **M96.1: Post-Laminectomy Syndrome, Not Elsewhere Classified**
  - **R26.2: Difficulty in Walking, Not Elsewhere Classified**
  - I25.10: Atherosclerotic Heart Disease of Native Coronary Artery without Angina Pectoris
  - Z98.61: Coronary Angioplasty Status
  - E11.51: type II diabetes mellitus with diabetic peripheral angioplasty without gangrene

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**Examination**

- **General Information-Systems Review- ROS**
  - **Significant Medical Conditions:**
    - Peripheral circulatory disorder with type II diabetes
    - Hypercholesterolemia
    - Benign Essential Hypertension
    - Coronary Arteriosclerosis with stents X2 2 RCA 4/16
    - PVD with claudication
    - Spinal Stenosis lumbar region
    - Synovitis/tenosynovitis of the right wrist
  - **BMI 35.4**

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**Examination**

**Current Medication:**

- 81 MG aspirin daily
- Atorvastatin 80 MG daily
- Glipizide 5 MG tablet 2 times daily
- Humulin n 100u/ML subcutaneous suspension 65 units a.m. 50 units p.m., Humulin R 100unit/ML injection 25 units in a.m. and 25 units in p.m.
- Hydrochlorothiazide 25 MG .5 Q a.m.
- Lisinopril 5 MG tablet daily
- Metoprolol Tartrate 25 MG tablet half in the morning and half in the evening
- Nitroglycerin PRN
- No Pain Meds.

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**Examination**

- **General Information:**
  - **Imaging: MRI lumbar spine 2/2016:**
    - L2/3 posterior disc osteophyte.
    - L3 4 disc bulge with facet arthropathy and Ligament thickening-moderate stenosis.
    - L4/5 grade 1 retrolisthesis with severe facet arthropathy and ligament thickening creating a moderately severe canal stenosis.
    - L5/S1 grade 1 retrolisthesis with severe facet arthropathy.

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### Examination

- **Subjective Examination**
  - CC: 10/2016 addressing and managing low back and right buttock pain limiting standing, walking, bending, carrying and pushing/pulling, S/P lumbar laminectomy for decompression L3/4-L4/5 6/16.
  - The patient reports these limitations have converted into progressive generalized weakness, reduced balance and significantly limited trunk and lower extremity mobility and performance during ambulatory ADL requirements.
  - Pain: The patient reports and describes back and buttock pain ranging in severity (5/10-9/10) during static and dynamic ADL ambulatory tasks. These symptoms are magnified with erect positioning in standing.
  - Oswestry Disability Index (ODI): Total Disability Percent Score: 28.

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### Examination: Tests and Measures

- **Posture:** Structural examination reveals a gentleman stands with bilateral hip flexion of 25 DG and 15 DG of knee flexion. Increased LSA and sacral base is level. Hypertonic hip flexors/back extensor paraspinals.
- **Palpation:** Tenderness to palpation bilateral lower lumbar paraspinals and especially (L > R) posterior lateral upper gluteal region. Stiff and tender iliopsoas and RE.
- **Gait:** Increased LSA with hip flexion posture, Compensated left Trendelenburg (pelvis drops right compensates holding left), bilateral hip external rotation (25°) with hip/knee flexion bias 20-25 DG and reduced trunk rotation and stride length.
- **6MWT:** 55 meters in 3 min. Without cane. Stop due to LBP and buttock pain. Minimal difference with cane.

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### Examination: Tests and Measures

- **ROM:**
  - Spine: Functional cervical spine mobility. Thoracic spinal mobility demonstrates 75% forward bending and 50% side bending and rotation. Lumbar spine mobility demonstrates forward bending side bending and rotation to L2/3.
  - Lower extremities: bilateral hip ROM demonstrates 15-125° hip flexion, (-15° hip extension to 0), 35° abduction bilaterally, 25° abduction bilaterally, 35° lateral rotation bilaterally and 20° left and 35° right internal rotation. Otherwise BLE WNL.
  - PIVM: hypomobility thoracolumbar and mid lumbar spine. Hypermobility L4/5.

  APTA  
Certified  
Professional

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### Examination: Tests and Measures

- **MMT:** Trunk and BLE 5/5, with exception of bilateral hip extension and abduction -4/5.
- **Special Tests:**
  - Positive Ober and Thomas tests bilaterally.
  - **PIVM: positive provocation for pain with extension >side bending >contralateral rotation.**
  - **Active intervertebral mobility:** During active ROM, positive provocation for pain with Lumbar extension >side bending >contralateral rotation. Esp. Palpated at recruitment L4.
  - Sustained alignment in and during repeated lumbar extension increased pain during ADL and examination.
  - **Flexion to the palpable level of L3/4 abated symptoms for side bending or rotation.**
- **Reflex/Sensory Integrity:** Intact and equal bilaterally. Exception, diminished vibration and pin entire plantar surface of the foot.



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### Evaluation

- **Impaired thoracolumbar, lumbosacral and bilateral hip joint mobility, motor function, muscle performance and ROM associated with spinal and bilateral hip disorders, connective tissue dysfunction and localized spinal inflammation.**
- Severely diminished ADL ambulatory function and performance due to impaired:
  - Thoracolumbar, lumbosacral and bilateral hip joint integrity/mobility.
  - Muscle performance, endurance and strength.
  - Spine and extremity extension + rotation dysfunctional mobility patterns impeding necessary spine and lower extremity biomechanics.
  - Cardiovascular and pulmonary endurance.

These impairments result in severely limited functional ADL ambulation tolerance and performance.



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### Diagnosis

- The House of Delegates position DIAGNOSIS BY PHYSICAL THERAPISTS HOD P06-12-10-09 states:  
  
*“A diagnosis is a label encompassing a cluster of signs and symptoms commonly associated with a disorder or syndrome or category of impairments in body structures and function, activity limitations, or participation restrictions.”*

<http://www.apta.org/Guide/>



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**Diagnosis 1**  
**Pathokinesiological Classification**

- Severely impaired ambulatory ADL secondary to insufficient thoracolumbar, lumbosacral and bilateral hip joint mobility, motor function, muscle performance and ROM associated with spinal, CVP and vascular disorders, connective tissue dysfunction and localized inflammation.
- (Describes the a cluster of impairments and cluster relationships as they effect movement but does not provide a diagnostic label for movement.)

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**Diagnosis 2**  
**ICF Low Back Pain Clinical Practice Guidelines**

**Chronic Low Back Pain with Movement Coordination Impairments**

- Chronic, recurring low back pain and associated (referred) lower extremity pain.
- Presence of 1 or more of the following: **ALL**
  - Low back and/or low back related lower extremity pain that worsens with sustained end range movements or positions.
  - Lumbar hypermobility with segmental motion assessment.
  - Mobility deficits of the thorax and lumbopelvic/hip regions.
  - Diminished trunk or pelvic-region muscle strength and endurance.
  - Movement coordination impairments while performing community/work-related recreational or occupational activities.

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**Diagnosis 3**  
**Movement System Impairment Classification for Low Back Pain**

**Lumbar Rotation with Extension Syndrome: ALL**

- Tendency for the lumbar spine to move in the direction of rotation and extension with movement of the spine and extremities.
- Lumbar spinal alignment tends to be extended and rotated relative to neutral with the assumption of various postures.
- Symptoms increase or are produced with lumbar spine positioned or moved into rotation and extension.
- Symptoms decrease with restriction of rotation and extension.

Harris-Hayes M, Van Dillen L, Sahrman S. Classification, Treatment and Outcomes of a Patient with Lumbar Extension Syndrome. *Physiotherapy Theory and Practice*, 21(3):181196, 2005

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### Current Challenges Movement Diagnoses

- Notice the diagnoses in # 2 and 3 shared no relationship with the comorbidities and the pathokinesiological affects.
- A focus on diagnostic elements of movement do not always capture relevant pathoanatomic-pathokinesiology factors.
- Need such related comorbidity clinic data not only for labeling the clinical decision making dimensions in POC for but also for billing and payment. (Complexity: Low-complexity (97161), moderate-complexity (97162), and high-complexity (97163))
- Also, no common language.



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### Orthopaedic Section Recognizes PT Practice Competencies, Roles and Responsibilities and Need for Practice Advancement and Identity

- Human movement is complex but physical therapists have the experience and tools to delineate dysfunctions within its complexity.
- Physical therapist practice considers the individual and the environment and applies movement related interventions to optimize functional capacity and performance.
- Physical therapy is a body of knowledge, not a verb or brand.
- Need to have characteristics of highly respected healthcare professions.
  - Responsibility for a system of the body, unique/specialized knowledge, expertise in diagnosis an treatment with relevant diagnostic labels.



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### Orthopaedic Section Recognizes PT Practice Competencies, Roles and Responsibilities and Need for Practice Advancement and Identity

- Support specialization. OCS
- Provide JOSPT
- Produce / Provide CPGs:
  - The Orthopaedic Section began the process to develop clinical practice guidelines in 2006.
  - To develop evidence-based practice guidelines that will enhance diagnosis, intervention, prognosis, and assessment of outcomes for a variety of musculoskeletal conditions commonly managed by physical therapists.
- Produce / Provide Orthopaedic Modules for APTA Registry



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### The Orthopaedic Section began the process to develop clinical practice guidelines in 2006

- **Follows the aims of the ICF**
  - Provide a scientific basis for consequences of health conditions.
  - Establish a common language to improve communications among healthcare providers.
  - Permit comparison of data across countries, healthcare disciplines, services and time.
  - Provide a system coding scheme for health information systems.

*J Orthop Sports Phys Ther 2008;38(4):167-168. doi:10.2519/jospt.2008.0105*



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### The Guidelines and Registry Modules Focus Primarily On: Structures related to movement within the ICF including;

- **Neuromusculoskeletal and movement related functions.**
- **Sensory functions.**
- **Pain categories.**

*J Orthop Sports Phys Ther 2008;38(4):167-168. doi:10.2519/jospt.2008.0105*



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### The Writing is on the Wall

- Healthcare reform looks to elevate access, value; cost containment and improve health of the individual and society.
- Requires an integration and collaboration across health professionals.
- This prescribes physical therapy to be identified as a body of knowledge that is recognize, appreciate and defined for its value within his clinical decision-making and approach to managing human systems.



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**THIS IDENTITY EVOLUTION AS MOVEMENT EXPERTS..**

*JOURNEY TO WHERE EVERYONE KNOWS YOUR NAME*

Important for our appreciation of knowledge for clinical decisions and recognized roles in collaborative value based care and the future identity for all of physical therapist practice. PT is NOT interventions.

Physical Therapist expertise is in the MOVEMENT SYSTEM!

APTA CSM

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**Current Needs for the Development of Movement System Framework:**

- Need to recognize and validate the system.
- Need to create a common language through defining diagnostic criteria, labels and classification systems.
- Need to create a roadmap for practice education and research.
- Need to refine and define to establish and enable advocacy for the margins of ownership within PT Patient/client management. (Process of care /Care pathways/CPGs/standards defining adherent care.)

APTA CSM

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**The Current Evolution in Physical Therapy**

Process of CARE  
Outcomes  
Value

CPG  
PROFITS  
COMPLIANCE  
Adherent Care

Movement System

Comprised of anatomical structures and physiologic functions that interact to move the body or component parts

Care Pathways = "What do WE in PT OWN?"

APTA CSM

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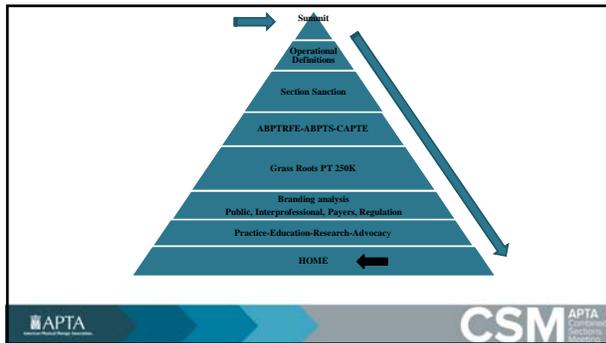
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### In Recognizing the Historical Philosophy of the Orthopaedic Section

The Ortho BoD will likely appreciate the importance and look to collaborate on the development and evolution of the movement system across:

1. Identifying and validating the movement system.
2. Creating a common language through defining diagnostic criteria, labels and classification systems.
3. Working on creating a roadmap for education, research, practice, payment and advocacy.
4. Promoting advocacy for developing the margins of ownership as defined by the movement system PT Patient/client management. (Process of care /Care pathways/CPGs/standards defining adherent care.
5. Including the movement system within the framework of our annual meetings and independent study courses.



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Moving Forward with the Movement System: A Case Report

Gammon M. Earhart, PT, PhD



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Disclosure

- No relevant financial relationship exists.



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Making Movement Your Mission

- Lead in **advancing human health through movement**, integrating interdisciplinary research, outstanding clinical care, and education of tomorrow's leaders to drive optimization of function across the lifespan.



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## Practice Education

- Continuing Education
- Fellowship
- Residency
- Entry-level training

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## Education: Movement is our Mission

The mission of the Education division is to prepare exceptional practitioners and researchers.

Our DPT and PhD programs, **rooted in the human movement system**, prepare you to excel as a practitioner or researcher working to advance human health.

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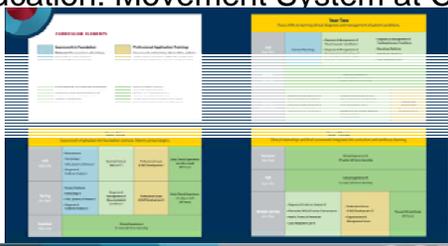
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## Education: Movement System at Core



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## Education Research

- Movement Science PhD
  - Bioenergetics (cardiopulmonary/endocrine)
  - Biomechanics (musculoskeletal)
  - Biocontrol (nervous)



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## Research: Movement is our Mission

The mission of the Research division is to understand how the **movement system** is affected by disease, injury, lifestyle, development and aging, and how **movement** can be used to promote health by enhancing physical function, activity and participation across the lifespan.



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## Research



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Research  Practice

- Movement as primary outcome and primary intervention



  APTA  
Certified  
Specialty  
Instructor

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**Transforming Society by  
Optimizing Movement:  
*An Achievable Vision for the Profession?***

*An Personal Perspective Related to  
Research, Practice & Education*

Christopher M. Powers, PT, PhD, FAPTA  
*University of Southern California*

**Identity**

- The physical therapy profession will define and promote the “movement system” as the foundation for optimizing movement to improve the health of society...
- The “movement system” is the core of physical therapist practice, education, and research...

Excerpts from the APTA Vision Statement, 2013

**My Personal Experience**

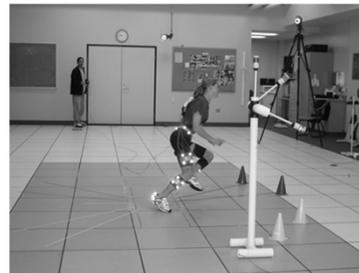
- Research
- Practice
- Education

**Research**

**Musculoskeletal Biomechanics  
Research Laboratory**



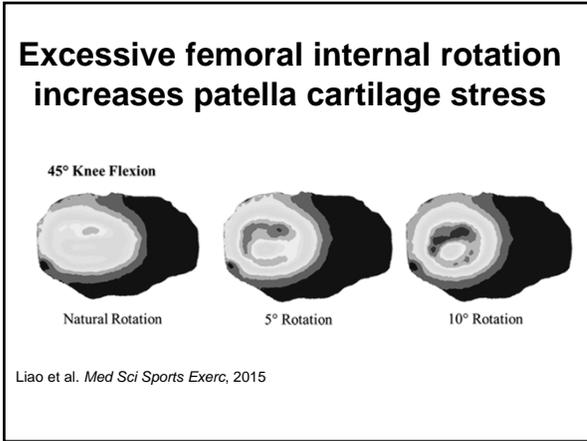
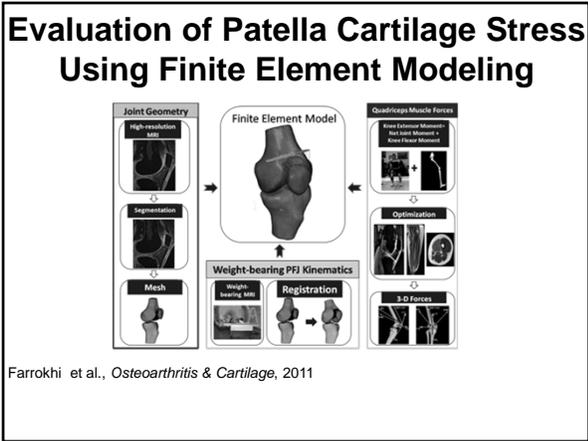
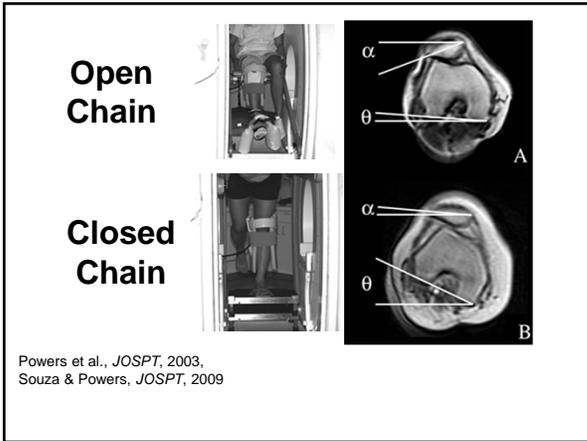
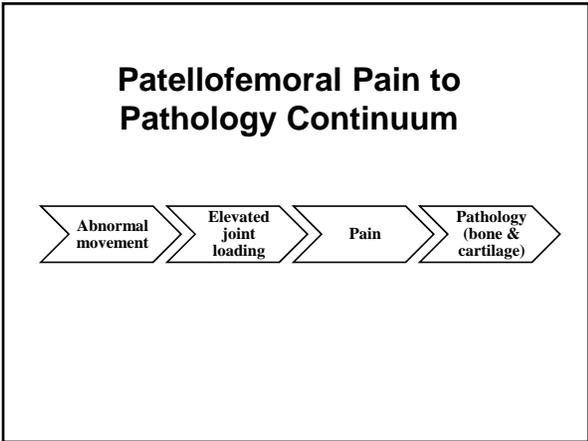
**Biomechanics Underlying  
Lower Extremity Injury**



**Overarching research theme:**

*Identification and understanding of injury mechanisms will lead to the development of more effective and efficient clinical interventions*

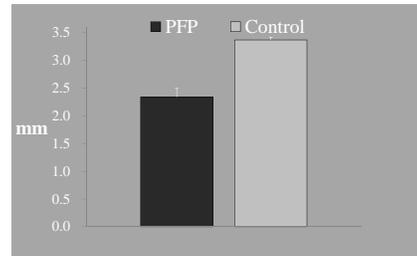
- What I have learned over the past 20 years?**
- Many if not most lower extremity injuries are the result of poor movement mechanics.
  - Treatment and prevention of lower extremity injuries should include a biomechanical or movement perspective.



### Possible changes in cartilage in response to abnormal stress

- Decreased cartilage thickness
- Decreased cartilage volume
- Loss of proteoglycans
- Increased water content

### Patella Cartilage Thickness



Farrokhi et al., *Am J Sports Med*, 2011

### Hip and Knee Kinematics are Associated with Pain and Function in Males & Females with PFP

Nakagawa et al., *Int J Sports Med*, 2013

- Peak hip internal rotation and adduction during a step down test were significant predictors of pain
- Peak hip adduction was a significant predictor of function

### Paradigm shift in the treatment of PFP

Hip Control to Improve Patella Tracking & Minimize patellofemoral stress

*Emphasis on gluteus maximus & medius*



The Effects of Isolated Hip Abductor and External Rotator Muscle Strengthening on Pain, Health Status, and Hip Strength in Females With Patellofemoral Pain: A Randomized Controlled Trial

Khayambashi et al., *JOSPT*, 2012

Posterolateral Hip Muscle Strengthening Versus Quadriceps Strengthening for Patellofemoral Pain: A Comparative Control Trial

Khayambashi et al., *Arch Phys Med Rehabil*, 2014

### Applied Movement System Research

- What are the underlying causes of movement dysfunction?
- How are movement impairments linked to pain, functional limitations & pathology?
- What are the best strategies/approaches to change movement behavior?

# Practice

## Movement Performance Institute



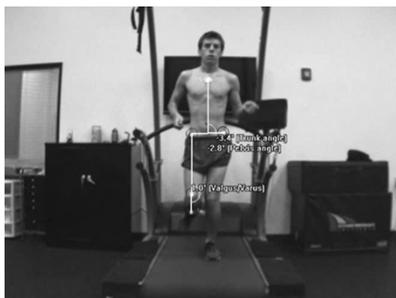
## Quantifying Movement Impairments



## Why Evaluate Movement Clinically?

- Most patients seek out a physical therapist care because of pain
  - Typically activity or movement related
- Abnormal movement patterns can cause lower extremity injury
  - Joint stress (bone & cartilage)
  - Soft tissue strain (ligament & tendon)
  - Muscle overuse

## Patellofemoral Pain with Running



## Ready to Return to Sport?



**Patients Expect Healthcare Providers to Use Technology to make a Diagnosis!**



**Clinical Example:**

***Runner with Lateral Hip Pain***

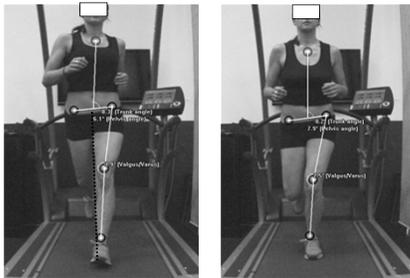
**Common Impairments During Running**

1. Cross-over sign (Initial contact)
2. Dynamic knee valgus (Deceleration)
3. Dynamic knee varus (Deceleration)
4. Excessive hip adduction/pelvic drop (Deceleration)
5. Excessive hip internal rotation (Deceleration)
6. Excessive pelvic drop (Deceleration)
7. Excessive foot pronation (Deceleration)
8. Limited hip and/or knee flexion (Deceleration)
9. Knee forward of toe (Deceleration)
10. Vertical or extended trunk (Deceleration)
11. Lateral trunk flexion (Deceleration)
12. Limited hip extension (Toe off)
13. Excessive vertical displacement of COM (Toe off)

**Common Impairments During Running**

1. Cross-over sign (Initial contact)
2. Dynamic knee valgus (Deceleration)
3. Dynamic knee varus (Deceleration)
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10. Vertical or extended trunk (Deceleration)
11. Lateral trunk flexion (Deceleration)
12. Limited hip extension (Toe off)
13. Excessive vertical displacement of COM (Toe off)

**Anterior View: Deceleration**



**Treatment Focus:**

**Changing Movement Behavior**

## Changing Movement Behavior



## Education

### The Big Picture

- **Make movement analysis an early and central theme in the curriculum.**
  - Emphasis on whole body; multi-segmental motion
- **Promote and develop the skill of movement analysis as a critical tool for physical therapist practice.**
- **Development of a “movement analysis language” that can be used across the curriculum.**

### Semester 1

- **To provide the student with a basic framework to analyze a wide range of functional movements by which normal and pathological movement can be evaluated.**
- **Emphasis was placed on typical movement patterns in healthy persons**

### Movement Analysis Language (Including Gait Analysis)

- **Phase:** A portion of a given movement cycle
- **Objective:** The basic requirement(s) of a given phase
- **Critical event:** Joint or segment motion(s) or positions that are required to accomplish an objective for a given phase



## Semester 2

- Using the framework developed in the first semester, the purpose of this course was to analyze, compare, and contrast normal and pathological movements.
- Emphasis was placed on atypical movement patterns in persons with pathology

## Questions/Comments?

Physical Therapists  
**IMPROVE**  
the Way You *Move*