

Balance Perturbations and Dynamic Balance Training

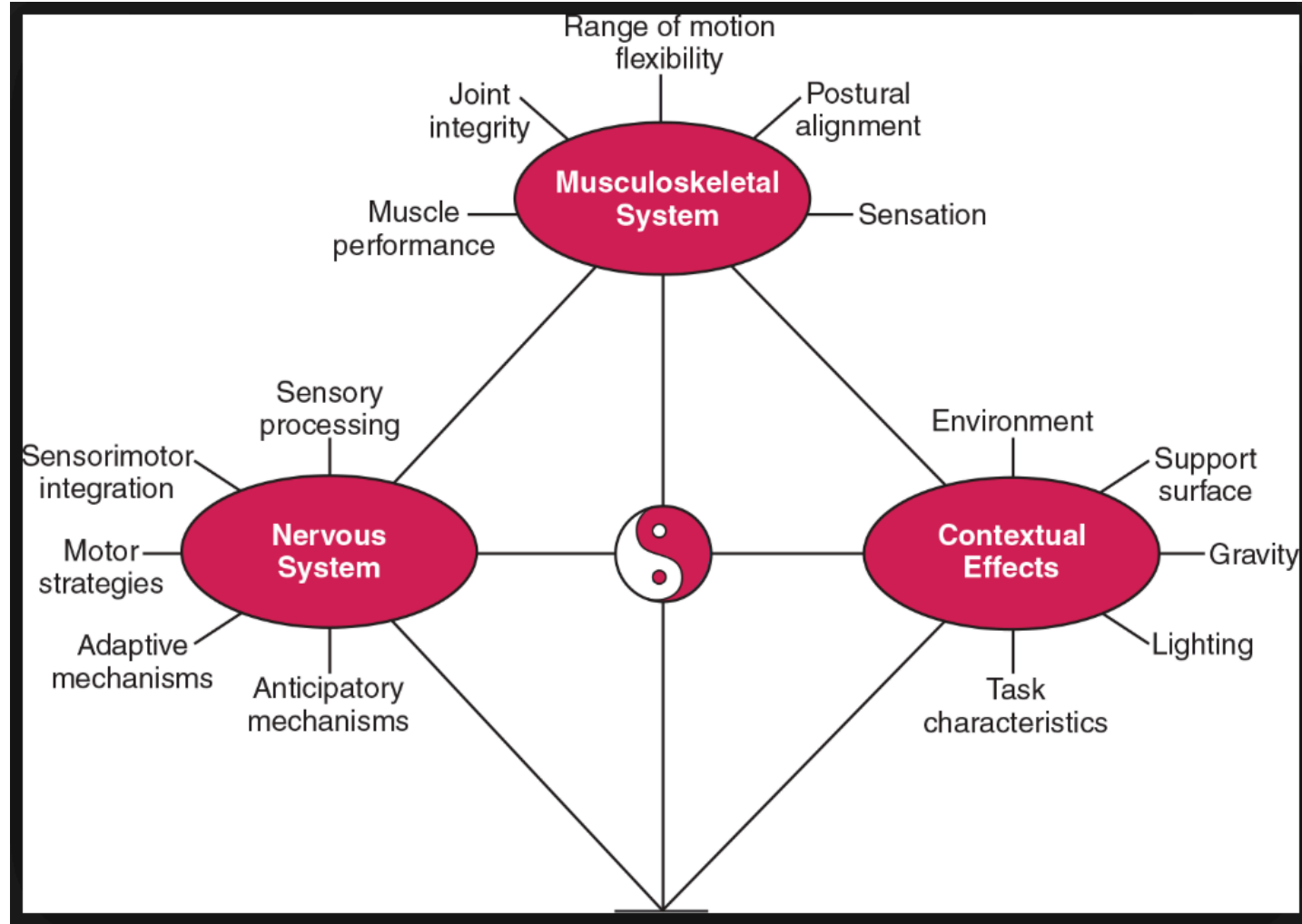
AgeWell Collective Episode #31
Christian Thompson, Ph.D.



Objectives

- Describe the importance of dynamic balance capabilities for older adults to live successful lives.
- Understand the threats to maintaining Center of Pressure within Base of Support and our intrinsic strategies to do this.
- Understand how the Timed Up and Go Test provides a valid means to measure dynamic balance.
- Learn dynamic balance training exercises that can be progressed and regressed for older clients.

Balance: A Complex Phenomenon



Essential Exercise Elements

- Accumulation of 50 hours of exercise to reduce OCCURRENCE but only 2 weeks to reduce RISK

Sherrington, 2011 *NSWPHB*

REQUIRED COMPONENTS

- Joint Mobility
- Sensory Stimulation
- Muscle Strength/Power
- Static/Dynamic Balance
- Gait Enhancement



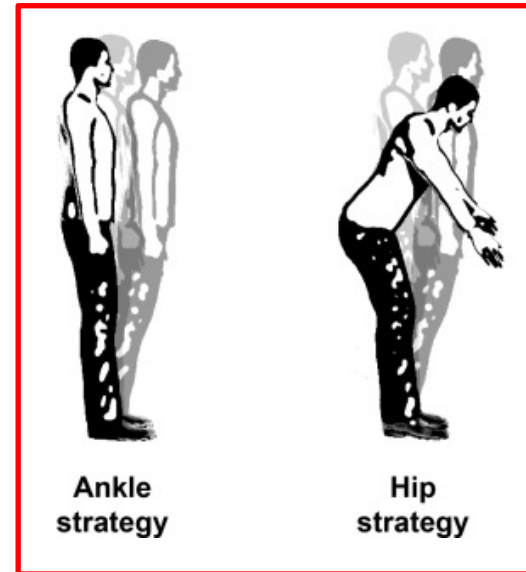
Dynamic Balance Basics

- Base of Support (BOS)
- Maintainin/Regaining COP over BOS

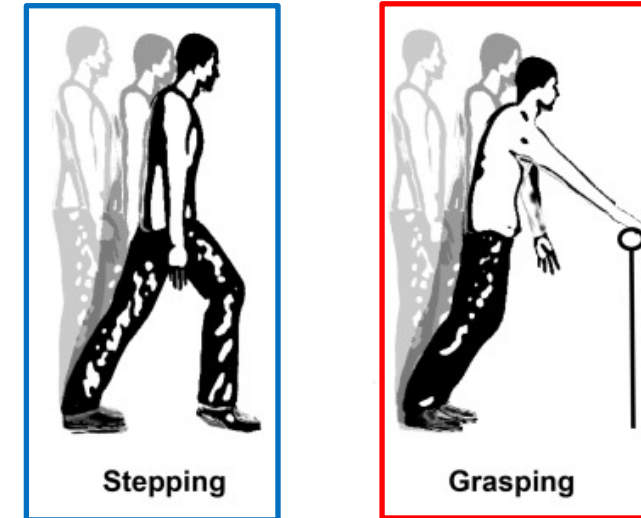
Affected By

- Joint MOSTABILITY (Ankle & Hip in Particular)
- Sensory Integration (Visual & Vestibular)
- Muscle Strength/Power (Lower Body)

Corrective strategies



Protective strategies



Sometimes they happen together:

e.g., walking a balance beam, grabbing a handrail
going up/down stairs

What Challenges Dynamic Balance?

- Planned/Anticipated
 - Rhythmic (e.g., walking)
 - Asynchronous (e.g., jumping, cutting/turning)
- Unplanned/Unanticipated
 - Tripping/Stumbling
 - Surface Changes
 - Perturbations



Assessing & Programming Dynamic Balance

Walk Test

- Developed by Podsiadlo & Richardson (*JAGS* 1991)
- Measures several aspects of function including ambulation & postural control
- Modify by increasing walking speed to “fast but safe”
- Outcome measurement is time ($\pm 0.01\text{sec}$)





Walk Test

Walk Test

Task Demand Analysis

- Sit to Stand: Concentric Strength, Core Strength
- Straight Line Ambulation: Muscle Power (acceleration), Joint Mobility (stride length, symmetry and amplitude), Dynamic Balance (consistency of line), Eccentric Control (deceleration), Muscle Strength (stance phase)
- Cone Turn & Turn To Sit: Vestibular and Visual (movement orientation), Dynamic Balance (rotational stepping), Muscle Strength (stance phase)
- Stand to Sit: Eccentric Strength, Core Strength

AWC Dynamic Balance Assessment – Walk Test

AWC Assessment Battery

Client's Name: _____ Age: _____ Current Date: _____

Limitations: _____



WALK TEST (Measured to the closest 0.01 second)	Right Turn Trial 1 Right Turn Trial 2 Left Turn Trial 1 Left Turn Trial 2	Score: _____ seconds Score: _____ seconds Score: _____ seconds Score: _____ seconds	Repeated efforts getting out of chair? ☐ Yes ☐ No Felt/appeared wobbly during straight line ambulation? ☐ Yes ☐ No Lost balance during cone turn/kicked over cone? ☐ Yes ☐ No Shuffled feet during straight line ambulation/cone turn? ☐ Yes ☐ No Lost balance preparing (turning) for chair sits? ☐ Yes ☐ No Chair sit was out of control (plopped down/almost fell out of chair)? ☐ Yes ☐ No
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Choose the Level of Challenge for Dynamic Balance Exercises

Assessment	Poor 20% & Below	Below Average 21-40%	Average 41-60%	Above Average 61-80%	Excellent Above 80%
TUG	>11.5 sec	11.5 - 9.0 sec	8.9 - 7.8 sec	7.7 - 6.6 sec	< 6.6 sec

Level of Challenge Mapping

- Poor Score = Level 1 Exercise
- Average Score = Level 3 Exercise
- Above Average Score = Level 5 Exercise

Any Good Exercise Exists On A Continuum!!!



Types of Dynamic Balance Exercises

- Stepping Challenges
 - Shift COP from one foot to the other with control
 - Modify difficulty via support, direction, distance, speed of motion...etc.
- Perturbation Challenges
 - Application of unanticipated forces during motion
 - Modify difficulty with pushes, pulls, sensory distractions, amount of force...etc.

Level 2 Dynamic Balance (Sagittal)



Thanks & Stay Tuned!!



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Next: Episode #22 – Postural Control & Cognition
w/ Ryan Glatt – Thursday March 18th

