STRENGTHENING  
THE  
GERIATRIC PATIENT  
FOR FUNCTION

Instructor: Michelle Green, MS, PT

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SESSION 307

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Strengthening the Geriatric Patient for Function
Michelle Green, MS, PT

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North Carolina

I live here
CAPE FEAR HEALTH SYSTEM

500 BED ACUTE CARE
70 BED IN-PATIENT REHAB FACILITY

WHAT DO OUR PATIENTS SAY THEIR GOALS ARE?

- Getting to the bathroom
WHAT DO OUR PATIENTS SAY THEIR GOALS ARE?

- Getting to the bathroom
  So... we give them....

WHAT DO OUR PATIENTS SAY THEIR GOALS ARE?

- Walk like before

WHAT DO OUR PATIENTS SAY THEIR GOALS ARE?

- Walk like before
  So, we give them.....
WHAT DO OUR PATIENTS SAY THEIR GOALS ARE?

- Walk like before
  So, we give them.....

  To get stronger...

WOULD YOU...

- GET INTO A POOL....

WOULD YOU...

- GET INTO A POOL....

  TO LEARN A FREE THROW???
WOULD YOU...

- DO MORE BENCH....

WOULD YOU....

- DO MORE BENCH....

TO LEARN BACH ON THE PIANO?

WE EXPECT A COACH TO KNOW THE MECHANICS OF THE SPORT...
THEN.... A THERAPIST SHOULD KNOW THE MECHANICS OF THEIR SPORT....

LIFE.
ADL’S.
GAIT.

WE WOULDN’T PAY A COACH IF THEY DIDN’T KNOW THE BASIC MECHANICS OF THEIR SPORT....

The COACH then sets up drills with similar demands, directional changes, muscle activation patterns and speeds of movements as the sport he is coaching....

Pitchers train differently than outfielders....
OUR SENIORS NEED A “COACH” TO GET THEM BACK INTO LIFE.

WHY DO SENIORS STRENGTH TRAIN?

To achieve aesthetically appealing muscles
To achieve bulk and power for competition
To maximize efficiency and safety of movement in many activities of interest

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FUNCTION!!!

OUR GOAL:
FUNCTION NOT FORM

MODEL BASED ON TASK ANALYSIS VERSUS REPS/SETS AND WEIGHT SELECTION
(we restore function – not personal train!)

LET’S LEARN TO MAKE OUR EXERCISES COUNT, TO BE COACHES OF HUMAN MOVEMENT
PLAN OF ACTION

- ALIGNMENT
- TRUNK INITIATION
- MUSCLE ACTIVATION
- HOW IS MUSCLE USED
- RE-EDUCATE

ONE TASK AT A TIME.

CHANGE YOUR THOUGHT PROCESS...

ICF MODEL

Werner AS. Use of the ICF Model as A Clinical Problem-Solving Tool in Physical Therapy and Rehabilitation Redstone. Phys Ther 2002; 82:11; 1108-1107
**ACTIVITY**
(dressing, bathing, walking, steps, transfers)
will improve ONLY when the identified IMPAIRMENT is addressed.

Transfers: Min assist for sit-stand.
ADL’s: Mod assist for dressing. Max assist for lower body bathing.

What information helps you come up with relevant, SKILLED treatment???

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**ACTIVITY**
(dressing, bathing, walking, steps, transfers)
will improve ONLY when the identified IMPAIRMENT is addressed.

PAST: Laundry list of problems
poor balance, poor strength, poor ROM

BETTER: Specific impairments for EACH task.
Min assist sit-stand due to dec. ant pelvic tilt, poor closed chain push through hip extensors, unable to sustain quads once standing.

THE DIFFERENCE....

Transfers: Sit-stand min assist for ant pelvic tilt to come forward
ADL’s: Mod assist for dressing to attend to left side of body.

What will I work on for transfers?
What will I work on in ADL’s?
CHANGE YOUR THOUGHT PROCESS...

- Instead of
  "Mrs. Jones has poor posture. Let's do postural re-education."
  Think….
  "What about Mrs. Jones posture is limiting her in wheelchair propulsion?"

- Instead of
  "Mr. Owens has weak LE's, let's do ther ex to make them stronger"
  Think….
  "What do we need to strengthen in Mr. Owen's legs to improve his sits to stand?"
  "What do we need to strengthen in Mr. Owen's to make it easier to get his pants on?"

WHY ALIGNMENT?

To Ensure Best Muscle Length for Best Activation Potential

Muscle is too short, not enough cross bridges can be formed
Muscle too long, not enough cross bridges can be formed
BOTH RESULT IN LIMITING TENSION/ACTIVATION POTENTIAL

NOT DIAGNOSIS BASED!!!

A stroke. No, MS, no, incomplete SCI, no left THR with resp. failure in surgery. No, drug overdose with chest tube on left side….DOESN'T MATTER!!!! Alignment 1st!!!!!
ALIGNMENT

- Which task? **PICK ONE TASK AT A TIME**
- Are we in best alignment? **USE BASIC PLUM LINE**
- Do we need to stop and do remedial work to get the body ready for alignment
  - ROM
  - joint mobs
  - muscle lengthening
  - soft tissue work

SOMETIMES YOU HAVE TO GO BACK BEFORE YOU GO FORWARD WITH THER EX!

ALIGNMENT

consider THER EX to address these impairments:
BEFORE the ther ex needed to improve the "strength" for the task....
Won't get strong if not aligned!

- PEC LENGTHENING
- SCAP RETRACTION
- SCAP DEPRESSION/LAT ENGAGEMENT
- TRUNK SYMMETRY (LENGTH AND ACTIVATION)
- CORE ENGAGEMENT
- PELVIC ALIGNMENT ON ALL PLANES

TRUNK INITIATION

- Where does the trunk initiate the movement for that task?
- Is the patient able to get into that position? If not, then THERE'S YOUR EXERCISE!
- If it does, then move on......
TRUNK MOVEMENT PATTERNS

THINK...

POINT OF INITIATION
UPPER TRUNK OR LOWER TRUNK

PLANES
SAGITTAL, FRONTAL, TRANSVERSE, DIAGONALS

TRUNK MOVEMENT PATTERNS

UPPER TRUNK INITIATED MOVEMENTS

SAGITTAL
• Flexion: bend down to pick up pen
• Extension: look at clouds above

DIAGONAL
• Flexion: reach to opposite side foot; sit-supine
• Extension: reach up and behind (seatbelt)

FRONTAL
• Flexion: place glass on floor to side

TRANSVERSE
• Rotation: look over shoulder behind you

NORMAL TRUNK MOVEMENT

UPPER TRUNK INITIATED MOVEMENT

LESS ADL’S BEGIN WITH THESE PATTERNS
TRUNK MOVEMENT PATTERNS

LOWER TRUNK INITIATED MOVEMENTS

• SAGITTAL
  - Anterior Tilt: sit → stand
  - Posterior: lifting foot to tie shoes

• DIAGONAL
  - Anterior Tilt: Reach outside BOS at angle
  - Posterior Tilt: crossing legs to put on shoes

• FRONTAL
  - Lateral reach outside of base of support

• TRANSVERSE
  - Rotation: scooting forward and back on mat in sitting

NORMAL TRUNK MOVEMENT

LOWER TRUNK INITIATED MOVEMENT

WHERE IN THE TRUNK ARE THESE TASKS INITIATED?

- Sit - Stand
- Putting pants on in sitting
- Wiping from the rear
- Lifting leg to get onto the step

Write down (3) others:
1.
2.
3.
**MUSCLE ACTIVATION**

- What joint actions are needed for the task?
- What muscles/groups of muscles are responsible for that joint action.
- Start activation… (consider e-stim!)
  - Single plane. Supported. (consider isometrics, gravity minimized, etc.)
  - Single plane. Unsupported.
  - BE SURE PROXIMAL CONTROL IS MAINTAINED!!!!!!
- Begin with ENDURANCE - low load, higher reps (15-20) allows for building of proximal stabilizers and form before intensity.
- Remember basics of muscle activation: gravity minimized, AAROM, e-stim, short vs. long lever lengths, 2 joint muscles….

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**Example...**

**WIPING FROM REAR**

Right LE must push into the ground to lift right hip and force weight shift to left to unweight right side.

Positioned to force weight and demand on right LE and provided cues for hip extension in position that simulates needs of task!

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**Example...**

**WIPING FROM REAR**

Right LE now active. Next....

Need right cervical rotation and right trunk rotation on active right LE.


Emphasis on building endurance, focus on quality and on sustaining needed trunk stability.
Example....
WIPING FROM REAR

Added shoulder extension on rotated trunk.

For extra demand... add theraband form the front.... Change color of theraband for progression.
Note: If no shoulder extension available would have gone back to soft tissue work, joint mobs, activation in isolation before adding to this task.

HOW IS MUSCLE USED?

QUESTIONS TO ASK
OPEN CHAIN or CLOSED CHAIN?
TYPE 1 or TYPE II MUSCLE FIBERS?
IN WHAT POSITION AND WITH WHAT OTHER MUSCLES?
DO I NEED SPEED OR IS IT A TASK
WHERE I SUSTAIN THE MOTION?

OPEN or CLOSED
- Your hand or foot is free to move.
- Tend to isolate a single joint or movement
- Your hand or foot is in a constant fixed position.
- Work multiple joints and multiple muscles
MUSCLE FIBER TYPES

Which type are predominate in the tasks you are working to rehab?

TYPE I MUSCLE FIBERS:
Muscular Endurance
Activities which require these fibers?

TYPE II MUSCLE FIBERS:
Muscular Strength/Power
Activities which require these fibers?

WHERE DOES SPEED FIT IN? IS THAT SAFE??????

Fiatarone et al.

STRENGTH TRAINING OF THE VERY OLD

- 9 Frail Institutionalized elderly (89-91 yrs)
- 1 MM Group trained for 8 Weeks
- Week 1: 50% 1RM, Weeks 2-8 80% 1RM

RESULTS:
Significant Strength Gains in all Subjects
Functional Mobility Improved
5 showed 48% increase in tandem gait test
Deconditioning: 32% loss of 4 weeks.

JAMA 1990
### SHORT STORY:
**RE: SENIORS AND RESISTANCE TRAINING**
- Type I & II fibers are loss with aging, but in addition, age related atrophy of the Type II left due to disuse.
- Slowed conduction, especially fast twitch
- After age 60, 1-2% decline in strength, 3-4% per year decline in power
- Lower extremities with greater muscular decline versus upper extremities
- Power loss is similar between sexes

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### WHY POWER FOR SENIORS?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair rising</td>
<td>Bean, Bean, Putoff, Bean, Bonnefey</td>
</tr>
<tr>
<td>Stair Climbing</td>
<td>Bean, Suzuki</td>
</tr>
<tr>
<td>Walking speed</td>
<td>Rantanen</td>
</tr>
<tr>
<td>Balance</td>
<td>Bean</td>
</tr>
<tr>
<td>6 Min. Walk Test</td>
<td></td>
</tr>
<tr>
<td>400 Meter Walk</td>
<td></td>
</tr>
<tr>
<td>Functional Walking</td>
<td></td>
</tr>
<tr>
<td>Falls</td>
<td>Skelton</td>
</tr>
<tr>
<td>Late Life Function and Disability</td>
<td>Curvilinear Response where increase in power shows increase in function</td>
</tr>
<tr>
<td>Falls</td>
<td>Metter, Putoff</td>
</tr>
<tr>
<td>Functional Status</td>
<td></td>
</tr>
<tr>
<td>Mortality</td>
<td></td>
</tr>
<tr>
<td>Curvilinear Response</td>
<td></td>
</tr>
</tbody>
</table>

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### PRINCIPLES OF STRENGTH TRAINING

**Overload**

*Must provide load that is new to the body, an overload, to get a positive training effect.*

Does overload have to be weight?
PRINCIPLES OF STRENGTH TRAINING

Specificity
Work muscles in a specific way to get a specific outcome. We only get strong in what we do.

BE TASK SPECIFIC!
If the muscle works fast- speed train your geriatric patient.
If the muscle needs type II activation, give demand!
If task needs prolonged scap stabilization - teach it!!!!

PRINCIPLES OF STRENGTH TRAINING

Progression
Continually providing the principle of overload over time to get continued benefits without a plateau

If you did it yesterday and they were successful, DON'T DO IT AGAIN... PROVIDE INCREASED CHALLENGE.

OVERLOAD & PROGRESSION DOESN'T ALWAYS HAVE TO MEAN “ADD WEIGHT”

Get Overload and Progression by:
- Change lever length
- Change support surface
- Change speed of movement
- Add elements together (single plane, multi plane)
- Dual task performance- talk and climb steps
  - Split stance versus feet side by side
- Change height of surface standing from or stepping onto
- Change type of clothing or footwear
- Provide auditory or visual distractions
- Change how long you hold the motion, or repeat it

The List is Limited only by You!
ONCE YOU KNOW HOW THE MUSCLE IS USED IN THE TASK..... SET UP THER EX TO MIMIC THE DEMANDS OF THE MUSCLE IN THAT SPECIFIC TASK.

EXAMPLE: SIT- STAND

Recipe for this task:
Ant pelvic tilt (for shift of COG ant. over BOS)
Ankle ROM
Hip Extension – push through heels
Quads- closed chain
Trunk/ Head stays neutral
COG finishes over/slightly ant BOS
Hip extends fully before knee extends fully

EACH THER EX/NMR YOU GIVE SHOULD RELATE DIRECTLY BACK TO A MISSING PIECE OF THE RECIPE FOR THAT TASK!!!

Pt. worked on ant. pelvic tilt in reversed sitting to improve initiation of sit – stand.
EACH THER EX/NMR INTERVENTION YOU GIVE SHOULD RELATE DIRECTLY BACK TO A MISSING PIECE OF THE RECIPE FOR THAT TASK!!!

Pt. worked on ant. Pelvic tilt in reversed sitting to improve initiation of sit – stand.

UBE backwards to enhance shoulder extension and post trunk rotation for improved upper body dressing.

Side step ups for glut medius activation for improve pelvic control in SLS phase of gait

WE CAN NOW IDENTIFY THE SKILLED PART OF OUR THERAPY!

Know your product.
Identify the missing pieces.
Develop interventions with ther ex to give to the patient what is missing for them to be successful with that task.

PUT IT IN YOUR DOCUMENTATION

RE-EDUCATE

- Re-educate the whole team of muscles to work together... adding the pieces together until it looks like the task!
- Once they have the gist of the task... vary attributes of the task- exaggerate it so they master the level they will need in daily living.

THINK:

NEURAL ADAPTATION
Improve the connection between brain and movement vs. hypertrophy
WHY NOT?

NOT FUNCTIONAL

BETTER...

DID YOU CONSIDER...

PUTTING IT TOGETHER

Case 1:
Patient is a 75 year old male, s/p pneumonia, 2 weeks in acute care with slight kyphosis, non-ambulatory PTA, needs to be able to propel wheelchair to and from the dining room at his assisted living.

INTERVENTION:

PUTTING IT TOGETHER

Case 2:
Patient is a 85 year old female, s/p left tri-malleolar ankle fracture, NWB left LE. Widowed. Cognitively intact. Lives alone.

INTERVENTION:
Ideas...Ideas...Ideas

- Set up Nustep for 5 different impairments
- 5 exercises to improve upright trunk control
- 2 functional tasks that need rounded shoulders and tight pecs
- 2 things to do in a wheelchair to improve hamstring activation

- Make it harder.....
## GROUP ACTIVITY

<table>
<thead>
<tr>
<th>LIFE ROLE</th>
<th>FUNCTIONAL LIMITATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GARDENER</td>
<td>FULL SQUAT</td>
</tr>
<tr>
<td>2. GRANDPARENT</td>
<td>PICKING UP CHILD</td>
</tr>
<tr>
<td>3. CLEANING</td>
<td>GETTING OFF FLOOR</td>
</tr>
<tr>
<td>4. TENNIS</td>
<td>DIRECTION CHANGES</td>
</tr>
<tr>
<td>5. GOLF</td>
<td>TEE OFF</td>
</tr>
<tr>
<td>6. FOLDING LAUNDRY</td>
<td>ARM ACTIVITY</td>
</tr>
<tr>
<td>7. VISITING FRIENDS</td>
<td>CLIMBING STEPS</td>
</tr>
</tbody>
</table>

### 1. WHY MIGHT THEY HAVE THAT LIMITATION?

### 2. WHAT SPECIFIC EXERCISES MIGHT YOU ADD TO THEIR PROGRAM?  (IDENTIFY EQUIPMENT, POSITION AND how many, what speed/ intensity)

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## IN SUMMARY.....

ONE TASK AT A TIME.

KNOW THE PARTS OF THAT TASK.

USE YOUR ASSESSMENT TO FIND OUT WHAT IS MISSING.

USE YOUR THERAPY TO GIVE BACK WHAT IS MISSING FOR SUCCESS IN THE TASK—THAT IS WHERE YOUR THER EX IS USED!

MAKE EVERY INTERVENTION NECESSARY AND RELEVANT TO THE SPECIFIC TASK YOUR SPECIFIC PATIENT NEEDS TO ACCOMPLISH.

PROGRESS. OVERLOAD. YES, TRAIN POWER!
THANK YOU!

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