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Clinical Use of the Reformer for Lower Body

Rhondi Miller, PT, MS, SCS, ATC

Introduction

- Rhondi Miller, PT, MS, SCS, ATC
- Over 25 years of orthopedic experience
- Board Certified APTA: Sports Clinical Specialist
- Certified Pilates Teacher - Pilates Method Alliance
- Comprehensively Certified Pilates Teacher - Balanced Body. Faculty: CoreAlign, MOTR
- Certified Athletic Trainer
- PT at Viverant (Mpls, MN) Director of PT/Pilates program
Course Sequence

- Pilates exercises are used frequently by PTs, however further detail on how patients can more fully benefit from Pilates is needed.
- There will be four courses in this series: Pilates Fundamentals for the PT Patient, Clinical Use of the Reformer for Core Integration, Clinical Use of the Reformer for the Lower Body, and Clinical Use of the Reformer for the Upper Body.
- The background and basis for Pilates is presented in course 1. Then is further developed in courses 2-4 on the reformer. Many outpatient clinics have a reformer. These courses will teach clinically-relevant exercises that address correcting dysfunctional movement patterns for the entire body.
- This will progress from basic local isolation, to regional interdependence and finally to global, whole-body integration.

Learning Outcomes

As a result of this course, participants will be able to:

- List three exercises effective in improving ankle strength and range of motion.
- List three exercises effective in activating deep six hip rotators.
- Describe two exercises effective in gluteal training.
- Describe at least two benefits of using jump board exercises for plyometric training.
Pilates Principles \(^1, 12\)

- 1) Breathing - connect mind/body, tissue oxygenation, supports performance
- 2) Concentration - cognitive attention while performing the exercises
- 3) Control - postural management, just the right amount of energy to perform
- 4) Centering - core, powerhouse, all work radiates outward from there
- 5) Precision - perform correctly, proper patterning, accurate movement
- 6) Relaxation - balance between work/relaxation, release unnecessary tension
- 7) Rhythm/Flow - smooth, coordinated transitions/movement
- 8) Balanced muscle development - all sides of the joint, all planes
- 9) Whole body movement - integration, global systems in sync throughout

Rehab Benefits of Pilates

- Improves posture, balance(3,4) and alignment(3)
- Effectively activates the mm’s of the inner unit(5, 6, 7, 8, 9, 10)
- Increases strength(3, 5, 7), mobility(3, 7,11) and flexibility(7,11)
- Decreases pain in chronic LBP patients (3, 12, 13, 14, 15)
- Increase Functional outcomes (3, 12, 13,14)
Benefits of Pilates

- Increases lung capacity and circulation (method of breathing)
- Creates muscle balance around a joint (OKC & CKC)
- Non-compressive to joints
- Much of the work is eccentric - controlling a load while mm is lengthening
- Can be applied to all ages, all levels of fitness
- Improves coordination - muscular and mental
- Improves bone density and joint health
- Improves body awareness

Definition of Inner Unit of Core

- Consists of
  - Transversus abdominis
  - Diaphragm
  - Multifidi
  - Pelvic floor
Definition: Outer Core/Unit \(16,17,18\)

- Deep Longitudinal system
- Anterior Oblique sling
- Posterior Oblique sling
- Lateral system

Role of the Core

- Support bony structure of pelvis, lumbar spine
- Position pelvis properly over femur bones
- Position ribcage over pelvis
- Coordinate timing of deep inner unit activation during static and dynamic postures
Creating Healthy Movement: in the lower body.

<table>
<thead>
<tr>
<th>Faulty Pattern</th>
<th>Corrective Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Overuse of hip flexors---Underuse of gluteals/abs</td>
<td>1) Set up exercise to bias extensors, have resistance assist into flexion. Cue posterior LE activation.</td>
</tr>
<tr>
<td>2) Muscling through with quads/calves, lack of lower body integration</td>
<td>2) Cue whole leg, balanced mm activation. Cue equal energy/intention in both directions even when spring is assisting.</td>
</tr>
<tr>
<td>3) Lack of integration of pelvic floor and TrA with lower body movement</td>
<td>3) As the patient encounters the resistance and has to push/pull against it, cue exhale and pelvic floor gradient activation (no overgripping)</td>
</tr>
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Creating Healthy Movement: in the lower body.

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<td>4) Lift/lower leg from hams/anter---poor core control, weak poster chain</td>
<td>4) Bend knee slightly if patient locks out knee to bias quad and find stability. Cue posterior chain/core support.</td>
</tr>
<tr>
<td>5) Poor dissociation of pelvis/lumbar- e.g. when flexes hip/s then pelvis tucks under. When extends hip/s then lumbar extends, lose core control</td>
<td>5) Teach hip hinging in small ranges of motion first. Use props to provided feedback to patient where spine and pelvis are in space. Cue core.</td>
</tr>
</tbody>
</table>
Foot and Ankle:

- **SUPINE**
- Footwork: (R-3R1G)
- Heels- balanced mm activation, alignment
- Arches- cup/intrinsics
- Toes- foot articulation, Ankle DF/PF; InveEver
- Treading
- Soleus
- Unilateral- heel, arch, toe, whole leg DF/PF
Foot and Ankle:

- SEATED ON FOOTBAR: (B-RB)
  - Ankle pumps: foot on carriage.
    Knee extended or flexed

- STANDING Face footbar: (B)
  - Ankle pumps: bent-knee, ball of foot on edge of carriage, thighs parallel, N hip

  cueing - foot, ankle alignment, relax ant tib
SUPINE:

Footwork: BILATERAL: (2R-3R1G)

- Heels- Hams vs. Quads .
  - Resistance heavy vs. light. resistance to Y bias hams to teach
- Arches
- Toes
- Full range, pulses.
- Props; band around thighs, ball between thighs

SUPINE:

Foot work: Unilateral – (R-3R)

- Leg extension
- SLR,
- Vary patterning to challenge with choreography
  - Band around knees: 1 leg bias hams, other hip flexor as press out/kick up.

pelvic stability challenged. Watch out for posterior tilting, rotation or hiking.
Knee: Quads/hams

- SIDELYING:
  - Leg Press Series (1R-2R1B)
    - On heel, energy of heel-to-glute pull
    - In parallel or ER
    - Slow, then pulses

- SEATED:
  - Leg Press (1B-2R)
    - Foot against reformer box vs. edge of carriage
Knee: Quads/hams

- PRONE:
  - Ham curls: (1RB-2R)
    - Bilateral: straps on arches, straps shortened
      - Parallel thighs, neutral pelvis/spine
    - Unilateral (1B or R)
      - Very challenging. Watch for side to side differences.

- Cue abdominals, spinal elongation
- Exercise looks different on a tight vs. flexible patient.
Knee: Quads/hams

- Standing Side Leg Press (1R-2R)
  - Stand on floor facing carriage, left foot on floor in slight turn out, right foot on shoulder rest in neutral.
  - Squat down, keep trunk over left leg, use right leg to press carriage out/in
    - Do slow full range of motion, can add quick pulses anywhere in the range of motion

Cue sitting back into the stance foot, ER thigh spiral on moving leg. Watch out for proper alignment: foot/ankle, ribs, hip hinge.
Hip Abduction/Adduction:

- Sidelying Thigh in strap series: (1B-2R)
  - Abd/add thigh in line with torso
  - Hip flexion/extension with bent-knee
  - Hip circumduction w bent-knee (building abd endur)
  - Abd/add with hip flexed to (90) or varying degrees

- Sidelying Foot in strap series: (1B)
  - Abd/add leg in line w torso- carriage doesn’t move much
  - Hip circumduction
  - Hip flexion/extension
  - Abd/add as moving thru hip flex/exten
Hip Abduction/Adduction:

- **STANDING** (on reformer) Side Split Series:
  - Standing Abd w foot on edge of carriage (1R-RB)
    - Full range, then pulses at outer range
  - Standing Skater: squat over foot plate leg, carriage leg presses out/in.
  - Widen stance, foot in middle of carriage (1B)
    - Careful, control range, emphasize closing of carriage, rest at bumper
  - Carriage closed, foot on edge (Y or no springs)
    - Squats – keeping carriage against bumper = active adduction control
    - Calf raises

Cue pelvic floor, breath, adductors without hip flexor gripping, hams activation, core control, proper rib and pelvis positioning.
Hip Extension/Flexion

- **Supine Bridging Series (3R-RB)**
  - Place heels, arches or toes on bar. Flat back(N) or articulate up into bridge without moving carriage.
  - Headrest down, maintain spinal elongation & ribcage connection throughout. Cue breath/pelvic floor/core integration.
  - Variations:
    - Legs together, legs apart, legs ER
    - Abduction bias with band or ring around knees: B/U
    - Adduction bias with ball or ring between knees: B/U
    - Bridge pressouts- leg extension, return fully w control
    - Single-leg Bridge: static or moving carriage, opposite leg flex/ext, abd/add, circumduction.
Hip Extension/Flexion

- Quadruped hip hinge (RY-RB)
  - Hands on foot bar, kneel with feet against shoulder rests, press carriage out with arms, lower torso to parallel: hold upper body stable as extend legs away. Return carriage by hinging at hips. Maintain neutral pelvis/spine.
  - This is an important exercise for teaching how to dissociate femurs from pelvis, as well as how to maintain a neutral spine/pelvis while managing a load thru a range of motion.
  - Cue glutes/posterior leg to concentrically press carriage away, then also to eccentrically control the return of the carriage (whereas the anterior hip relaxes on the return motion)
Hip Extension/Flexion

- Standing upright hip extension (B-R)
  - Standing facing footbar, back foot on shoulder rest, thighs parallel. Press carriage out with glute/hams without changing upright posture. May need support of footbar/pole.
    - This is a small range of motion. This tells the PT how much true hip extens the patient has, often patient compensates with lumbar extension/anterior pelvic tilt.
    - This is a functional upright posture.
    - If patient feels the work in the quad (not the goal) then cue isometric pull of foot up the shoulder rest (knee flexion)
Hip Extension/Flexion

- **Lunge Series (B-RB)**
  - Standing on floor facing foot bar, front foot in line with leg of reformer, back foot on shoulder rest (knee lifted). Press carriage back, as drop vertically into lunge position:
    - Variations:
      - Go up/down into lunge as carriage moves in/out
      - Hold front leg in static lunge as back knee extends/flexes
      - Hold back knee stable as front knee extends/flexes to move carriage horizontally (do not let trunk rise as move fwd/back)

If stand on reformer box on floor= more range, more challenge
Hip Extension/Flexion

- Standing in the well Glute series (B-RY):
  - Kneel on carriage, hands on footbar press out so that 1 foot can stand in well, opposite foot is on shoulder rest, knee lifted: Pitch body forward, creasing at hip, dissociating leg/pelvis (deeper lean=more work in glute of front leg)
  - Variations:
    - Hold body position as back leg moves carriage in/out
    - Hold body position as front leg moves carriage out/in
    - Hold carriage stable, hold front leg posture as rotate rest of body over stance leg (stable front femur as rotate pelvis/trunk) CKC ER/IR-very advanced.
Hip Rotators:

- Sidelying thigh in strap: (R-RB)
  - Combined Abd/ER/exten. Circumduction: Knee flexed 90
    - Start w legs in 90/90 in sidelying, abduct top leg then press into small extension while externally rotating femur. Keep knee bent to 90 in both directions. This is a small motion. Then do circles with femur, clock/counter clockwise.

- Sidelying foot in strap: (B-R)
  - Combined flexion/ER & exten/IR variations.
    - Circumduction: at varying angles of hip flexion:
      - As above but with strap on arch of foot. Longer lever arm challenges lumbopelvic stability and pelvifemoral control. Watch out for hyperextended/over use of quads- bend knee slightly.
Hip Rotators:

- **Sidefacing Quadruped Hip ER (B-R)**
  - Hands/knees on carriage facing sideways, place strap on foot closest to shoulder rest. Pull foot toward midline by ER femur. Choose ROM appropriate for patient. Can start at end range of IR and pull thru whole range.

- **Sidefacing Quadruped Hip IR (Y-B)**
  - Hands/knees on carriage facing sideways, place strap on foot closest to footbar. Pull foot laterally focusing on IR of femur bone.

Focus on isolating movement deep in the hip/pelvis. Keep tension on strap in both directions. Watch out for hip hiking or ankle inver/ever.
Hip Rotators:

- Prone on Box: Hip ER/IR (Y-B)
  - Place reformer box longways in middle of carriage. Lie prone with knee caps off box. PT places strap on patient’s foot closest to shoulder rest for ER or on foot closest to foot bar for IR.
    - This position is an advancement from qped. Patient’s must maintain neutral pelvis/spine/hips as perform exercise.
    - Start with small, controlled range of motion. Palpate lateral glute area for ER, deep medial pelvis/hip to assess if IR are working.
    - Watch out for legs abducting, knees extending, ankle inver/ever, lumbar extension, hips flexing or pelvic rotation.
Jumpboard:

- Supine:
  - Ankle mobility/foot articulation (2R-3R)
    - Roll up into PF, press carriage out, lower heels, return carriage keeping heels down as long as possible in the ROM. Repeat in opposite direction. Cue alignment, use ball b/t ankles to provide feedback/support.
  - Foot intrinsics
    - Place a soft ball under feet/foot, maintain stability as move carriage in/out with leg extension/flexion. Ball provides feedback, works on control/stability of the foot/ankle, and can help with soft-tissue release.
Jump Series:

- Bilateral Jumping (RB)
  - Leg strengthening, core control, cardio training
  - Variations:
    - Legs parallel: together, apart, apart/together
    - Legs ER: together, apart, apart/together
    - Jumping side to side, also with LE rotation (slalom)


Jump Series:

- Bilateral jumping: Lighter resistance (R-Y)
  - For Core and LE patterning
  - Head up: pillow or supported curl-up throughout
  - Variety of leg positions:
    - parallel, ER, scissors, straddle, etc.
  - Varied ranges of motion
    - Full jump, partial range, ankles only

Same foundations as on above slide
Jump Series:

- Unilateral Jumping: (B-RB)
  - Easier on core/neck
  - Allows for focus on 1 side: alignment, strength
  - Challenges pelvis stability more
  - Non-jumping leg varied positions:
    - Stable in table-top
    - Extends in/out over jumpboard
    - Extends toward ceiling: knee ext/flex mirrors jump leg
    - SLR: lifts up/down in opposition to jump leg
    - Lots of choreography options: props, band around thighs

Cue foot articulation, stable spine, breath, deceleration, relaxed neck/shoulders.
Jump Series:

- Sidelying: Unilateral jumping (B-R)
  - Lying on side on carriage w head supported in N, bottom leg bent and pulled up onto carriage for support
  - Top leg jumping:
    - Parallel, ER, combo of parallel/ER
  - Bottom leg jumping:
    - Hold top leg into abduction throughout, above jump board
    - Can add adduction: both legs pull toward each other when carriage is in the out phase - quick, challenging

Builds proprioception as patient can’t see landing foot. Caution with ankle DF limitations, careful of deep knee flexion/PF compression. Cue hip hinge, gluteal and core control on landing. Soft landing.
Clinical Pearls

- APTA Vision Statement on the profession of physical therapy=
  “Transforming society by optimizing movement to improve the human experience” (20)

- The Pilates Reformer is an intervention that a PT can use to train fundamental movement patterns and correct chronic, unhealthy movement in patients. The reformer allows for 3-D, whole body training & integration.

Clinical Pearls

- Watch for overgripping with muscles
- Watch for the path of least resistance
- Cue ease and efficient movement, if they can’t move efficiently, step back and analyze. Stop and correct- cue better, regress, break into parts, put back together. May need manual intervention.
- Continue to push their edge in order to see what strategies the patient chooses. Do they revert to their old, unhealthy patterns? If so, they are not integrating/applying the learning.
Clinical Pearls

- Remember the stance limb/s or stabilizing limb/s are just as important as the moving ones.
- Just as much energy should be spent controlling the return movement as the initial movement:
  e.g. return phase of leg pull downs are just as impt.
- Breath can help facilitate abdominal and pelvic floor activation. Breathing during Pilates training assists patients with chronic pain who tend to be shallow breathers.
- Quality over quantity
- Patient keeps learning as tasks are constantly changing while looking for same, competent patterning.

Clinical Considerations

- Input to patient from:
  - PT’s verbal & manual cueing
  - Feedback from reformer: set-up, positioning, straps, springs, level of resistance
- Reformer can be assistive to the patient
  - Helping to facilitate or inhibit patterning just by the set up/exercise you choose (e.g. quadruped hip hinge: exten/flex to inhibit hip flexors as the springs assist return of the legs/carriage)
- Whole body integration emphasis on the reformer assists with progression to regional & global movements (after the PT has corrected or worked locally with a joint/injury).
Dysfunctional Postural patterns¹: Lower Crossed Syndrome

- **Lower Crossed**
  - Anterior pelvic tilt, increased lumbar lordosis
- **Tight/Active**: iliopsoas; rectus femoris; erector spinae; TFL; adductors; QL
- **Weak/Inactive**: rectus abdom; gluteals; VL/VM; Piriformis; hams
- **Rehab Goal**: open anterior hip, adductors and low back; strengthen abdominals & glutes; strengthen deep hip rotators and abductors.

Dynamic Kinetic Chain Integration

- **Regional → Regional dynamic → Global → Global dynamic**
- **Example**: progression for lower body: hip rotation strengthening
  - Sidelying thigh in strap hip series
  - Sidelying foot in strap hip series
  - Qped facing side w strap on foot, resisted hip IR/ER
  - Prone facing side w strap on foot, resisted hip IR/ER
  - Standing in well, CKC hip ER/IR on stance leg.
Summary

- The Reformer is a powerful rehabilitation tool in the hands of a physical therapist.
- It’s assistive, gives much neuromuscular feedback.
- Works neuromuscular control both conc/eccentric.
- Trains movement competency
- Non-compressive to joints and FUN for patients.
- Can easily progress to the functional, global dynamic patterning that allows for Full Recovery.
References/Thank You!!

- References are on separate .pdf

- Rhondi Miller, PT, MS, SCS, ATC
- Feel free to contact me with any questions, rmiller@viverant.com