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Clinical Use of the Reformer for Core Integration

Rhondi Miller, PT, MS, SCS, ATC

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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

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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.

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Learning Outcomes

After this course, participants will be able to:

- Describe the role of the breath in supporting abdominal activation.
- List three roles of the core during rehab exercises.
- List at least two components of a proper abdominal brace when the goal is lumbopelvic stabilization.
- Describe at least three keys to core integration for each of the following positions: supine, side-lying, quadruped and prone.
- Identify at least two common, faulty substitutions present in patients with weak core muscles.

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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

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Pilates Movement Principles[1]

- Breathing -lateral breath in hook lying
- Neutral Pelvis-pelvic rock- supine/4-pt
- Core Activation-isometric abs, prone activation
- Abdominal Strengthening-curl ups
- Lumbopelvic Stability- knee folds, feet in straps
- Spinal Mobility & Stability- swan, articulating bridge
- Scapular Mobility & Stability- ribcage arms, Qped, plank
- Alignment-all ex's
- Release Work-skull clock, pelvic clock, knee stirs

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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)

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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

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Definition of Inner Unit of Core

- Consists of
  - Transversus abdominis
  - Diaphragm
  - Multifidi
  - Pelvic floor

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Definition: Outer Core/Unit [16,17,18]

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

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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

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Role of the Core

- The core is more than just abdominal muscles. It also includes diaphragm, multifidi, pelvic floor muscles (also known as the inner unit)
- Also involves how the arms/legs “communicate” with the core
- Importance of using the core as a “governor” “regulator” for all movement, posture and alignment
- Importance of coordinated activation of inner and outer units to create efficient movement between the legs, pelvis, spine, thorax and shoulder girdle

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Breathing Facilitates Core Activation[1]

- In Pilates breath is trained primarily as posterolateral rib breathing. Ribcage expands posteriorly [without distending abdomen] & laterally as inhale, then ribcage and waistline narrow on exhale (e.g. the100)
- In most cases, the inhale is on the prep and return phase; whereas the exhale is during the working phase/against resistance.
- Pilates breathing can also focus on diaphragm & pelvic floor. Train breath during pelvic mvt.
- Breath can support the movement, as well as the spine especially when the abdominals are at their outer range(lengthened). Inhale generally facilitates spinal extension, exhale spinal flexion.
- Breathing can release tension. Helps with chronic-pain patients.

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Supine core activation/integration

- Finding Neutral Pelvis
  - Pelvic rocking. Neutral position is patient dependent
- Legs in table top- maintain proper abdominal control. Monitor wrong strategies: e.g. hanging on back extensors, using hip flexors or popping abs, use of neck
- Hands in straps: abs series
  - Place ball b/t knees to cue adductor/pelvic floor connection
  - Arms pull down from upper back/scapular/serratus/abs

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Supine core activation/integration

- Hands in straps: abs series- Variations: (1R-2R)
  - Arms: pull downs, T pulls, triceps, small/big circles
  - Arms: STATIC carriage: Push into straps and move carriage out 1-2", then hold static.
    - Bil/unil horiz abd, "W's"
  - Legs: STATIC :
    - Bil/unil leg extension, knee folds, hip abd (bent or straight)
  - Arm/leg: STATIC:
    - opposite arm/leg abd (bent or straight) ipsi/contralateral

Working on breath, open collar bones, relaxed neck, engaged scapula/serratus/obliques/TrA, neutral spine/pelvis.

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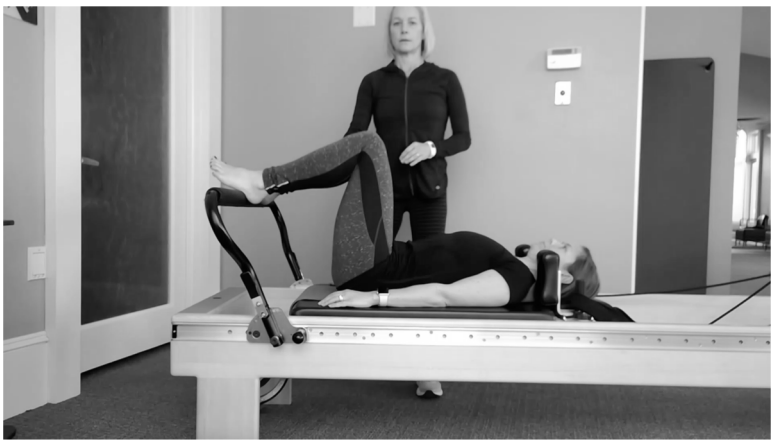
Video



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Supine core activation/integration

- Supine Curl ups: Variations: (1R-2R), arms pull down as:
  - Curl up with legs in table top
  - Curl up with legs at 45(varying angles)
  - Curl up with legs alternating scissor, reach, abd/add.
  - Oblique curl up toward 1 leg, opposite leg can stay bent or straight or lift/lower.
- Advanced
  - Supine arms/legs abd (snow angels)
  - Supine abs facing back, straps over knees(in full ppt)-1R

  Bil pull-ins from psoas, single-leg, criss cross, circumduction (>90)

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CONTINUED

Video

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Supine core activation/integration

- Supine Feet in Strap series: (1R1B-2R) focus on stable pelvis controlled by abs, while legs move independent of pelvis.
  - Pull downs: in parallel, ER (frog), IR, combo
  - Press outs: in parallel, ER, IR, combo
  - Circumduction: small/big

  With props: Ball between knees or ankles, magic circle around thighs or ankles or between knees or ankles.

  Ball under sacrum to create unstable base for those patients ready for challenge.

  - Peter pan: 1 leg flexes in frog, as other sweeps out into abd with leg straight. Bent leg is the driver. Stable pelvis is goal.

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Supine core activation/integration

- Supine Feet in Straps- STATIC carriage challenges
  - Maintain stable carriage and pelvis while
    - Abd/adduct unilateral/bilateral legs. For unilateral the stabilizing side is held by abs, no rotation of pelvis is allowed.
    - Extend 1 or both legs from starting position of frog- cue patient to extend from back of leg, relax anterior hip as leg is fully supported by foot in strap.

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CONTINUED

Videos

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Videos

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Videos

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Quadruped core activation/integration

- Kneeling abdominals facing forward- R-B-Y
- Kneeling abs face forward modified plank ankles over shoulder rests (R)
- Kneeling abs face back- Neutral, face back (B-R). Rounded or flat back. Forearms on box.
- Kneeling abs face back- obliques (Y-B)
- Kneeling abs face back-single leg (Y)
- Facing side torso twist with hands on frame/box on floor (no springs, or 1Y)

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CONTINUED

Videos

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CONTINUED

Videos

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Videos

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Quadruped core activation/integration

- Quadruped facing back arm series (1B-1R)
  - Hand on head rest, other arm on strap, engage core as pull arm back. Maintain balance/neutral as encounter resistance. Control in both directions. Watch out for: overactive upper traps/pecs/neck/hip flexors/low back; unstable pelvis. Use core to lift ribcage off pelvis and pelvis off femur; stay centered, humerus/femur spiral
    - Can pull straight arm, triceps, circumduction
    - Can increase intensity by lifting opposite leg throughout (bird/dog). Watch out for neutral pelvis/spine, centered stance femur, alignment of lifted leg

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Video

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Sidelying Core Considerations

- Mermaid variation- pushing(R) & pulling[infinity bar](B)
  - Press out with arm as actively laterally flex spine, stay elongated
- Side plank forearm on footbar knees bent, or hand on foot plate (R)
  - Careful: very unstable, maintain sidebody/core/adduc connection
- Side plank forearm on head rest, knees bent with arm series (Y)
  - Tall elbow prop, oppos arm pull downs, flex/ext, triceps, circles.
- Full side plank, hand(s) on foot bar (RY-RB)
  - Cue side body stability, adductor/glute support, breath as move.
- Long box, side-facing, assisted lateral flexion (3R)
  - Maintain elongation throughout, assist w front arm.

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Videos

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Videos

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CONTINUED

Videos

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CONTINUED

Prone Core activation/application

- Swan on box: face forward (1R-2R) & back (B-Y)-
  - pull with arms to extend thoracic spine, retract/depress scapulae, maintain spinal elongation/alignment & abs engaged, collar bones open.
- Kneeling plank with ankles over shoulder rests (R)
  - Press out with shoulders while maintaining plank/open hips
- Full plank hands on foot bar, feet against shoulder rests [caution w 1st MTP OA] (RY-RB)
  - Maintain 1 long line as press carriage out from shoulders, tight abs/adduc.
- Face Back hands on long box, feet on foot plate parallel, Oblique [feet rotated] (B-Y)
  - Hands 2/3rds down box, press out w legs, maintain abs/stability

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CONTINUED

Video

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Seated Core Considerations

- Seated on edge of carriage, no springs
  - pelvic rocks [sagittal], hip hikes [frontal], rotation on disc [transverse]. Focus on abs initiating and controlling the mvt.
- ½ roll downs: + rows, biceps, obliques (1R-2R)
  - Use abs to posteriorly rotate to move carriage, maintain roll down as add arm challenges. Do not collapse/compression vertebrae.
- Torso twist facing back (B-R)
  - Seated facing pulleys, cross straps, legs crossed over head rest.
  - Pull with posterior row as rotate torso toward pulling side. Tall posture, active core throughout.

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CONTINUED

Video

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CONTINUED

Clinical Pearls

- APTA Vision Statement on the profession of physical therapy=

"Transforming society by optimizing movement to improve the human experience" (20)

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

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Clinical Pearls

- Watch for over gripping 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.

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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.

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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. supine thigh in strap, kneeling abs- both help to inhibit hip flexors as the springs assist return of the legs)
- 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.

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Low Back Pain: effective ex's

- To activate Core while in neutral spine:
  - Supine abdominal series (may do in poster tilt=more supportive)
  - Kneeling abdominals- facing forward/back
  - Quadruped arm pulls- progressing to bird/dog
  - Feet in straps series

→ progressing to rotational ex's & planks(long-lever)

- To open a compressed/tight lumbar spine:
  - seated ½ roll downs (without collapsing)
  - round-back kneeling abdominals, focus on breath

→ progressing to supine knee pull in's facing back

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CONTINUED

Osteoporosis/extension based

- Ex's on previous slide in Neutral spine/flat back
- Prone swan facing forward and back- without compression
- Upcoming courses- bridging series, kneeling chest expansion, prone pulling strap series.

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Common movement faults

1. Overuse of hip flexors---Underuse of gluteals
2. Popping of rectus abdominis---Overuse of lumbar extensors
3. Holding of breath
4. Over gripping with neck flexors
5. Lack of integration of pelvic floor and TrA
6. Winging of scapulae---popping of ribs
7. Muscling thru with arms, lack of core connection/integration
8. Lift/lower leg from quads/anter--- poor core control, weak poster chain
9. Poor dissociation of pelvis/lumbar- e.g. when activate abs then pelvis tucks under.

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Tips to Overcome/Correct

1. Choose ex's that facilitate posterior chain/line(ADL's are flex/anter based).
2. Cue ribs, palpate abs, may do better in posterior tilt until gets stronger.
3. Cue long, slow inhales (on rest or less-effort phase), slow exhale on effort phase.
4. Place pillow under head in supine, cue chin retraction, lengthen poster neck.
5. Place ball b/t knees to cue adductor→pelvic floor→TrA connection. Cue breath to facilitate diaphragm/pelvic floor connection.
6. Teach sternal drop, cue serratus, cue anterior rib connection/narrowing
7. Cue arm/ribcage/core connection, cue eccentric phase, proximal focus
8. Set up so hams/poster push into resistance, anterior relaxes on return
9. Teach isometric abs activation in neutral pelvis, slowly add in mvt.

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Upper/Lower Crossed Dysfunctional Postural patterns[1]:

- Upper Crossed
  =Forward head, rounded shlds
- Tight/Active: lev scap; middle/upper trap; SCM; scaleni; subscap; Lats; Pecs; biceps
- Weak/Inactive: Low trap; serratus; rhomboids; supraspinatus; deltoid, deep neck flexors; triceps
- **Rehab Goal**: open anterior chest, stretch neck, lateral trunk; strengthen scapular retractors/depressors, strengthen upper back & RTC, train cervical retraction prior to abdominal curl up.

- Lower Crossed
  =Anter 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.

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Dynamic Kinetic Chain Integration

- Regional→ Regional dynamic → Global → Global dynamic
- Example: progression in quadruped
  - Qped isometric abdominal activation
  - Qped facing back abdominals
  - Qped facing back arm pull
  - Qped facing back arm pull with leg extension hold (bird/dog)
  - Qped facing back bird/dog with arm/leg both moving
  - Qped hands on shld rests, strap on foot, leg extension hold
  - Qped hand on shld rest, arm lift, leg moves flexion/extension
  - Roll onto side (coronal plane)- leg & arm move in coronal, progress sagittal, then to transverse planes- whole body has to integrate different loads and control through entire range of motion
- Continue to progress same mvt patterns to ½ kneeling, then standing=global

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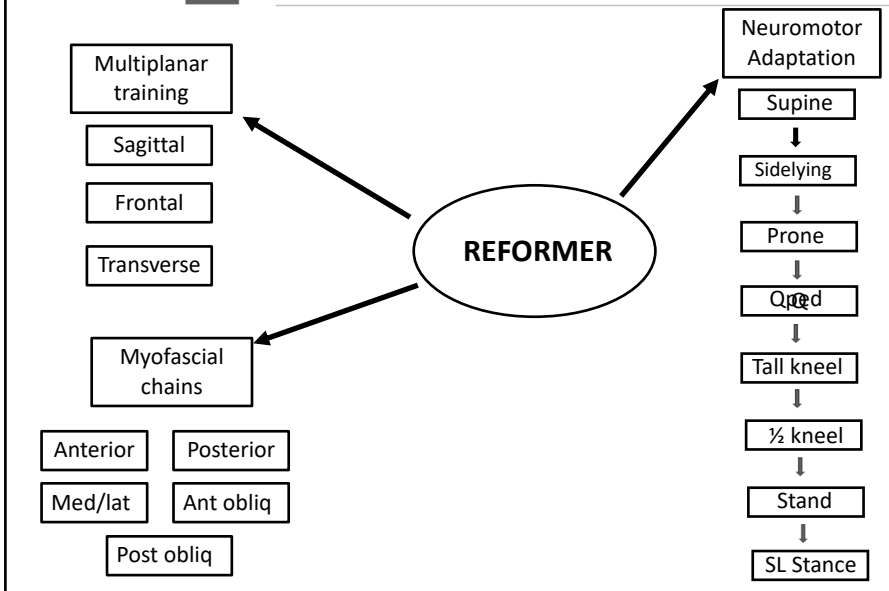

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Summary

- 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.

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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

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