

RU RMT 19 — REMEDIAL EXERCISE & KINESIOLOGY

Lecture 15

Lumbar & Sacroiliac Region: Anatomy, Postural Assessment & Core / Pelvic Exercise Foundations

Regional musculature, postural analysis, and foundational remedial exercise for the lumbopelvic complex

Learning Objectives

- **By the end of this session, the learner will be able to:**
- Identify and describe the muscles of the lumbopelvic and SI region, including their primary actions relevant to remedial exercise.
- Explain the role of the deep core system (transverse abdominis, multifidi, pelvic floor, diaphragm) in lumbopelvic stability.
- Recognize and differentiate anterior and posterior pelvic tilt through observation of associated muscle imbalances.
- Select, teach, and cue foundational remedial exercises for the pelvic floor, lumbar region, and core.
- Apply appropriate breathing, dosage, and progression principles when prescribing core stability exercise.
- Identify safety considerations and general precautions before assigning lumbopelvic exercise.
- Document exercise prescription in a manner consistent with CMTCA and CMTO expectations.

Session Overview

- Part A — Regional Anatomy: muscles of the abdominal wall, back, pelvic floor, hip, and thigh that act on the lumbopelvic complex.
- Part B — Conditions & Injuries: an orientation to the presentations covered in depth in Lecture 16.
- Part C — Pelvic Floor: function, contributing factors, Kegels, and integrated core exercises.
- Part D — Lumbar Region: mobility, strengthening principles, and foundational exercises.
- Part E — Postural Assessment: anterior and posterior pelvic tilt.
- Part F — Pelvic Tilts: the base isometric and its progressions.
- Part G — Core Abdominal Bracing: bent-knee fall-out, heel slides, planks, bird dog, and dead bug.
- *Each exercise is taught, demonstrated, practised, and returned by the learner before progression.*

Why the Lumbopelvic Region Matters

- The lumbar spine and SI joints transfer the load of the upper body to the lower limbs during standing, walking, and lifting.
- Low back pain is one of the most common complaints presenting to massage therapy; remedial exercise is a core component of long-term management.
- The region relies on a balance between mobility (lumbar spine) and stability (SI joint, deep core), and dysfunction often reflects a loss of that balance.
- Muscle imbalance — some muscles short and facilitated, others long and inhibited — drives many postural presentations seen in practice.
- Remedial exercise complements manual therapy by restoring strength, endurance, motor control, and flexibility between treatments.
- **Within the RMT scope, exercise is prescribed to support the treatment plan, matched to the client's stage of healing and ability, and always with informed consent.**



Bony & Ligamentous Landmarks

Bony Landmarks

- Five lumbar vertebrae (L1–L5) with large weight-bearing bodies.
- Sacrum — wedge of five fused vertebrae forming the posterior pelvis.
- Coccyx — the terminal tail of the spine.
- Ilium, ischium, pubis — fused as the innominate (hip) bone.
- Iliac crest, ASIS, PSIS — palpable pelvic landmarks used in postural assessment.
- Intervertebral discs — cushion and permit controlled motion.

Key Ligaments

- Iliolumbar ligament — anchors L4–L5 transverse processes to the ilium.
- Sacroiliac ligaments (anterior, posterior, interosseous) — stabilize the SI joint.
- Sacrotuberous & sacrospinous ligaments — resist sacral rotation (nutation).
- Supraspinous & interspinous ligaments — limit lumbar flexion.
- *Ligaments provide passive stability; muscles provide active, adjustable stability.*



Muscles of the Lumbopelvic & SI Region

Trunk & Back

- Internal and External Obliques
- Rectus Abdominis
- Transverse Abdominis
- Erector Spinae
- Latissimus Dorsi
- Quadratus Lumborum
- Pelvic Floor

Hip & Thigh

- Gluteus Maximus / Medius / Minimus
- Piriformis
- Deep Hip External Rotators (Gemelli, Obturators, Quadratus Femoris)
- Iliopsoas
- Adductors
- *These muscles are examined individually across the next slides.*

Internal & External Obliques

- Location: the two diagonal layers of the lateral abdominal wall; external oblique fibres run “hands-in-pockets,” internal oblique fibres run perpendicular to them.
- **Actions:**
 - Trunk flexion (working with rectus abdominis).
 - Trunk rotation — the external oblique on one side works with the internal oblique on the opposite side.
 - Lateral flexion (side-bending) to the same side.
 - Increase intra-abdominal pressure to support the spine.
- Remedial relevance: key rotators and lateral stabilizers of the trunk; trained with oblique-emphasis planks and rotational control drills.
- Weakness or poor timing contributes to inefficient trunk control and can load the lumbar spine.

Rectus Abdominis

- Location: the paired, vertically oriented “six-pack” muscle running from the pubic crest to the ribs and xiphoid process, divided by tendinous intersections.
- **Actions:**
 - Primary trunk flexor — approximates the ribcage and pelvis.
 - Assists in posterior pelvic tilt and resists excessive lumbar extension.
 - Contributes to intra-abdominal pressure and core support.
- **Postural relevance: rectus abdominis is stretched/lengthened in anterior pelvic tilt and shortened in posterior pelvic tilt — a key observation in assessment.**
- Remedial relevance: strengthened through curl-ups and controlled flexion work; however, deep stabilizers (transverse abdominis) are prioritized for spinal control.

Transverse Abdominis (TrA)

- Location: the deepest abdominal layer; fibres wrap horizontally around the trunk like a corset, attaching into the thoracolumbar fascia.
- **Actions:**
 - Compresses the abdominal contents and increases intra-abdominal pressure.
 - Creates a stiffening “brace” that stabilizes the lumbar spine before limb movement.
 - Part of the deep core cylinder with the multifidi, pelvic floor, and diaphragm.
- **Remedial relevance: the foundation of core abdominal bracing; strengthening TrA is a central aim for almost every low-back presentation.**
- Cueing: “gently draw the belly toward the spine” or “brace as if about to be nudged,” without breath-holding or belly-button suck-in that bears down on the pelvic floor.

Erector Spinae

- Location: the three columns — iliocostalis (lateral), longissimus (intermediate), spinalis (medial) — running vertically along the spine.
- **Actions:**
 - Bilateral contraction → spinal extension and control of forward bending (eccentric lowering).
 - Unilateral contraction → ipsilateral lateral flexion and rotation.
 - Maintain upright posture against gravity.
- **Postural relevance: shortened in anterior pelvic tilt; lengthened in posterior pelvic tilt.**
- Remedial relevance: the lumbar erectors and multifidi are strengthened to build back endurance and keep back pain “at bay”; also a common site of strain (covered in Lecture 16).

Latissimus Dorsi

- Location: the broad, fan-shaped muscle of the back; originates from the thoracolumbar fascia, lower thoracic and lumbar spinous processes, iliac crest, and lower ribs, converging to insert on the humerus.
- **Actions:**
 - Shoulder extension, adduction, and internal rotation.
 - Through the thoracolumbar fascia, contributes to lumbopelvic and SI stability.
 - Links the upper limb to the opposite lower limb via fascial slings, assisting force transfer in gait.
- Remedial relevance: because it attaches into the thoracolumbar fascia and iliac crest, latissimus tension can influence lumbar mechanics; it participates in cross-body “slings” used in diagonal core work.

Quadratus Lumborum (QL)

- Location: a deep, quadrilateral muscle of the posterior abdominal wall spanning the 12th rib, lumbar transverse processes, and iliac crest.
- **Actions:**
 - Lateral flexion of the trunk to the same side.
 - Elevation of the ipsilateral hip (“hip hiking”).
 - Assists lumbar extension and stabilizes the 12th rib during breathing.
- **Remedial relevance: a key lateral core muscle trained with side planks and farmer’s carries; a common site of strain (Lecture 16).**
- Note: unwanted QL activation (“hip hiking”) must be avoided during glute-med exercises such as monster walks.

Pelvic Floor Musculature

- Location: a sling of muscles (notably levator ani and coccygeus) spanning the base of the pelvis from pubis to coccyx.
- **Functions:**
 - Supports the pelvic and abdominal organs.
 - Contributes to continence (bowel and bladder control).
 - Separates the pelvic cavity from the perineal region.
 - Forms the floor of the deep core cylinder, working with TrA, multifidi, and diaphragm.
- **Remedial relevance: strengthening reduces the risk of incontinence and boosts core strength and stability — detailed in Part C.**

Gluteus Maximus / Medius / Minimus

- Gluteus Maximus: the largest, most superficial glute; the primary hip extensor and lateral rotator. Strong activation takes load off the hamstrings and lumbar erectors.
- Gluteus Medius: fan-shaped abductor on the lateral pelvis; the key frontal-plane stabilizer that keeps the pelvis level in single-leg stance.
- Gluteus Minimus: deep to medius; assists hip abduction and internal rotation and helps stabilize the femoral head.
- **Remedial relevance:**
 - Glute max is trained with hip extensions/bridges; glute med with clams, abduction, and monster walks.
 - Weak glutes are implicated in low back pain, SI dysfunction, and pelvic-tilt patterns.

Piriformis

- Location: deep gluteal muscle running from the anterior sacrum to the greater trochanter of the femur.
- **Actions:**
 - External (lateral) rotation of the extended hip.
 - Abduction of the flexed hip.
 - Helps stabilize the hip and sacrum.
- **Clinical relevance: the sciatic nerve passes beneath (or in some people through) the piriformis; tightness can compress it, producing piriformis syndrome (Lecture 16).**
- Remedial relevance: commonly stretched to relieve sciatic-type symptoms; glute-med strengthening offloads it by improving hip stability.
- In anterior pelvic tilt, the hip external rotators (including piriformis) are often limited/restricted.

Deep Hip External Rotators

- The “deep six” lateral rotators of the hip, working alongside piriformis:
 - Superior and inferior gemelli.
 - Obturator internus and obturator externus.
 - Quadratus femoris.
- **Actions:**
 - External rotation of the hip.
 - Fine control and stabilization of the femoral head in the acetabulum.
- **Remedial relevance: function like the “rotator cuff of the hip” — small stabilizers whose control matters more than their strength; addressed with hip-stability and rotation-control work.**

Iliopsoas

- Location: the combined psoas major (from the lumbar vertebrae) and iliacus (from the iliac fossa), inserting together on the lesser trochanter of the femur.
- **Actions:**
 - Primary hip flexor.
 - Assists lumbar stabilization; psoas has direct attachments to the lumbar spine.
 - Contributes to anterior pelvic tilt when short/tight.
- **Postural relevance: tightened hip flexors are a hallmark of anterior pelvic tilt; the iliopsoas arrow “pulls” the pelvis forward.**
- Remedial relevance: stretched to reduce anterior pelvic tilt and lumbar loading; balanced against glute and abdominal strengthening.

Adductors

- Location: the muscle group of the medial thigh — adductor longus, brevis, and magnus, plus pectineus and gracilis.
- **Actions:**
 - Adduction of the hip (drawing the thigh toward midline).
 - Contribute to hip flexion and to frontal-plane pelvic control.
 - Adductor magnus (posterior fibres) also assists hip extension.
- **Remedial relevance: work with the glute med/min to control the pelvis in single-leg stance; imbalance between adductors and abductors affects lower-limb alignment and lumbopelvic loading.**

Conditions & Injuries of the Region

Disc, Joint & Nerve

- Disc Herniation
- Degenerative Disc Disease
- Osteoarthritis
- SI Joint Dysfunction (hyper- / hypomobility)
- Piriformis Syndrome
- Sciatica

Postural, Sprain & Strain

- Anterior / Posterior Pelvic Tilt
- Sprain — iliolumbar, sacroiliac, sacrotuberous ligaments
- Strain — quadratus lumborum, erector spinae
- *Each condition is addressed in full in Lecture 16, with staged exercise protocols and precautions.*

Pelvic Floor: Function & Clinical Relevance

- Exercises to strengthen the pelvic floor help reduce the risk of incontinence and boost core strength and stability.
- The pelvic floor separates the pelvic cavity from the perineal region.
- It forms the base of the deep core cylinder: diaphragm on top, transverse abdominis around, multifidi behind, pelvic floor below.
- A well-functioning pelvic floor co-contracts automatically with the deep abdominals to support the spine before movement.
- **During a correct contraction the pelvic floor lifts, the deep abdominals draw in, and breathing continues — there is no breath-holding or bearing down.**

Factors Affecting the Pelvic Floor

- **Pelvic floor function can be affected by:**
 - Constipation and chronic straining.
 - Surgery to the pelvic area.
 - Childbirth.
 - Muscle tearing.
- **Correct technique (Diagram 2 concept):**
 - Correct action — the pelvic floor lifts, the deep abdominals draw in, and there is no change in breathing.
 - Incorrect action — pulling the belly button hard toward the backbone while holding the breath causes bearing-down on the pelvic floor.
- *Teaching the difference protects clients from reinforcing a harmful pattern.*

Kegel Exercises

- Purpose: improve the tone and function of the pelvic floor muscles.
 - Common cue: the sensation of “stopping the flow of urine” isolates the target muscles.
1. Identify the pelvic floor muscles using the “stop the flow of urine” sensation (as an identification cue only, not a daily practice on the toilet).
 2. Gently clench (lift and draw up) the pelvic floor muscles.
 3. Relax fully — the clench-and-relax together constitute one Kegel.
 4. Continue breathing normally throughout; avoid breath-holding and bearing down.
 5. Dosage: perform 3 sets of 10 repetitions of Kegels per day.
 - *Progress by lengthening the hold once the client can perform reps with good control.*

Integrated Core: Supine Bridge

- Combines core stability with emphasis on pelvic floor engagement.
1. Lie supine with knees bent and feet flat on the floor.
 2. Engage the pelvic floor and lift the hips off the ground.
 3. Hold for up to 10 seconds while continuing to breathe throughout.
 4. Lower with control and repeat.
 - Progression — single-leg: start with hips on the ground, lift and bend one knee toward the chest, hold, then return to the starting position; alternate legs while keeping the pelvis level.

Integrated Core: Wall Squat

- A weight-bearing exercise integrating pelvic floor engagement with functional lower-limb strength.
1. Stand against a wall with feet shoulder-width apart.
 2. Engage the pelvic floor and lower yourself into a squat, as if sitting into a chair.
 3. Hold for up to 10 seconds while continuing to breathe throughout.
 4. Press through the feet to return to standing with control.
 - *Keep the low back in contact with the wall and the knees tracking over the toes.*



Lumbar Region: Strengthening & Stretching Principles

- Focusing on the lumbar erector spinae and multifidi helps increase strength and stability and keeps back pain at bay.
- Stretching the piriformis and strengthening the transverse abdominis and glutes all help alleviate low back pain.
- The goal is balanced control: adequate lumbar mobility with strong, enduring deep stabilizers.
- **Foundational lumbar exercises include:**
 - ROM exercises for the lumbar region (lateral flexion and rotation).
 - Supine bridge and its modifications/progressions.
 - Bird dog, supermans, and sloppy push-ups (introduced on the following slides).



Lumbar ROM: Lateral Flexion & Rotation

- Restores and maintains controlled motion of the lumbar segments.
- 1. Position: can be performed standing or seated.
- 2. Perform gentle lateral flexion (side-bending) within a comfortable range.
- 3. Perform gentle rotation within a comfortable range.
- 4. Focus on engaging only the lumbar region.
- 5. Avoid producing the movement from only the thoracic region or from the hips.
 - *Move slowly and stay within a pain-free range; quality of isolation matters more than range achieved.*



Supine Bridge: Modifications & Progressions

- The supine bridge is a great starting point for lumbar strengthening.
- 1. Base: supine with knees bent, feet flat; engage the core and glutes and lift the hips.
- 2. To modify: lie supine and raise one leg toward the ceiling, focusing on contracting the core muscles and glutes.
- 3. To progress: incorporate leg movements such as moving the raised leg in a circle or a square shape.
- 4. Keep the pelvis level and the low back controlled throughout — no arching or dropping.
 - *Progress only when the client maintains a stable, level pelvis at the current level.*



Bird Dog & Supermans

- **Bird Dog:**
 - From all fours, extend the opposite arm and leg while keeping a neutral spine and level pelvis.
 - Builds anti-rotation control and multifidus/erector endurance (full procedure in Part G).
- **Supermans:**
 - Prone; lift the arms, chest, and legs to work the lumbar extensors through extension.
 - Strengthens the erector spinae and posterior chain.
- *Both are “other great exercises” for the lumbar region and integrate well with the bridge and ROM work.*
- **Use pain-free range and avoid aggressive end-range extension in clients with extension-sensitive conditions.**



Sloppy Push-Ups (Prone Press-Up)

- Involves lumbar extension; helps people suffering from or with a history of disc herniation.
1. Lie prone with the hands under or just beside the shoulders.
 2. Press the upper body up, allowing the hips and pelvis to stay relaxed toward the floor so the lumbar spine extends (the arms do the work, not the back muscles).
 3. Cue the client to visualize “pushing the disc back in.”
 4. Lower with control and repeat within a comfortable range.
 - *Caution: be careful when advising clients with osteoarthritis or facet joint irritation, as extension may aggravate these conditions.*

Anterior Pelvic Tilt

- **Typically presents with and is caused by:**
 - Increased lumbar lordosis and thoracic kyphosis.
 - Stretched abdominal muscles (rectus abdominis).
 - Shortened erector spinae and shortened TFL/ITB.
 - Limitation of the hip external rotators (piriformis).
 - Weak / stretched gluteus medius.
 - Tightened hip flexors.
- **Common in athletes, standing occupations, and pregnancy.**
- *Correction pattern: stretch hip flexors and erectors; strengthen abdominals and glutes.*

Posterior Pelvic Tilt

- **Typically presents with and is caused by:**
 - Sway back and thoracic kyphosis.
 - Shortened abdominal muscles (rectus abdominis).
 - Lengthened erector spinae.
 - Tightened hamstrings.
 - Limitation of the hip rotators.
 - Weak / shortened gluteus medius.
- **Common in people who sit a lot.**
- *Correction pattern: mobilize/stretch hamstrings and shortened abdominals; restore erector and glute function.*

Pelvic Tilt Exercise (Base)

- The base exercise for all future pelvic-tilt modifications and progressions.
 1. Lie supine with knees bent and feet flat on the floor.
 2. Engage the core and imagine pulling the belly button toward the spine (toward the floor).
 3. The client should feel the back pressing into the floor and the hips and pelvis rocking back.
 4. Isometrically hold for 3–5 seconds while continuously breathing.
 5. Repeat 8–12 times.
 - *Mastery of this base pattern is required before adding limb movement.*

Pelvic Tilt Progressions I

- **Pelvic Tilt with March:**
 - Begin with the pelvic tilt and incorporate leg movement.
 - Lift one foot off the ground, bringing the knee in toward the chest; lower and alternate legs.
 - Keep the low back firmly on the ground throughout.
- **Pelvic Tilt with Double Knee Tuck:**
 - Start with the pelvic tilt, then tuck both knees in toward the chest.
 - Engage the core and keep the low back firmly pressed into the ground.
- *The unifying rule: the low back never lifts off the floor.*

Pelvic Tilt Progressions II

- **Pelvic Tilt with Single Leg Lowers:**
 - Start with the pelvic tilt; raise both legs straight toward the ceiling, then lower one at a time, alternating.
 - When lowering, keep the heel hovering off the ground — it should not touch.
- **Pelvic Tilt with Double Leg Lowers:**
 - Begins like the single-leg version, but raise and lower both legs together.
 - Keep the heels hovering off the ground on the lower.
- **Throughout both: engage the core and keep the low back firmly pressed into the ground.**
- *Other progressions include the bridge and wall squat.*

Core Abdominal Bracing: Concept

- Bracing means co-contracting the deep core cylinder (TrA, multifidi, pelvic floor, diaphragm) to stiffen and protect the spine.
- The goal is stability and motor control, not maximal effort — a firm, 360-degree brace held while breathing normally.
- Bracing exercises progress by adding limb movement while resisting unwanted pelvic rotation and lumbar extension.
- **The progression taught in this unit:**
 - Bent knee fall-out → knee lifts & heel slides → front plank → side plank → bird dog → dead bug.
- *Reference: Kinesiology & Care textbook (K&C), pp. 460–462, for the abdominal-brace family.*

Bent-Knee Fall-Out & Knee Lifts / Heel Slides

Bent-Knee Fall-Out (K&C p.460)

- Abdominal brace with knees bent.
- Slowly let one leg fall out to the outside, while maintaining core stability and preventing pelvic rotation.
- Return under control and repeat, alternating sides.
- *Teaches anti-rotation control of the pelvis.*

Knee Lifts & Heel Slides (K&C p.461)

- Abdominal brace with knees bent.
- Slowly bring one knee up so the thigh is perpendicular to the ground, then lower back down.
- Slowly slide one heel along the ground until the knee is extended, then bring it back up.
- **Resist pelvic rotation and lumbar extension throughout.**

Front Plank

- An isometric brace targeting the anterior and deep core.
 1. Start on the forearms and knees (entry level) or on the toes (more advanced).
 2. Make sure the elbows are under the shoulders.
 3. Ensure the client's head, shoulder, hip, knee (and ankle) are in line.
 4. Hold with a firm brace while breathing normally.
 - Advanced progressions: body-saw / inch-worms; wide hands and feet; feet lifted higher than arms; plank push-up alternating sides; spider-mans; plank scorpions; hip dips; plank with oblique knee tuck (front plank to side plank, elbow to knee); plank jacks.

Side Plank

- An isometric exercise, excellent for targeting the more lateral core musculature — the quadratus lumborum and obliques.
1. Start on the forearm and knees (entry level) or the feet (more advanced).
 2. Make sure the elbow is under the shoulder.
 3. Ensure the client's head, shoulder, hip, knee (and ankle) are in line.
 4. Hold with a firm brace while breathing normally, then repeat on the other side.
 - Advanced progressions: hip raises; star fish; same-side crunch (raised arm and knee to crunch); oblique twist with bent arm; oblique twist with extended arm (reach to ceiling, then lower with the back of the hand touching the ground).



Bird Dog & Dead Bug

Bird Dog (K&C p.462)

- Also called kneeling superman.
- Start on all fours: hands under shoulders, knees under hips; maintain a neutral spine.
- Extend one arm in front and return; extend the opposite leg behind and return.
- **Resist pelvic rotation and lumbar extension.**
- Progressions: add a crunch (elbow to knee); over a stability ball (hips on the ball, not the stomach); on hands and feet.

Dead Bug

- Supine, legs in the air, knees flexed to 90°.
- Maintain a neutral spine and brace the core.
- Slowly lower one leg at a time without allowing too much lumbar extension; add arms, then alternate arm-and-leg.
- Progressions: arms on wall / hold weight off ground; dead-bug bicycle; alternating and same-side core activation holding a ball; on a BOSU dome.
- **Beneficial for clients with lumbar hyperlordosis or anterior pelvic tilt.**

Summary, Safety & CMTCA Competencies

- **Key takeaways:**

- The lumbopelvic complex balances lumbar mobility with SI and deep-core stability; muscle imbalance drives most postural presentations.
- The deep core cylinder — TrA, multifidi, pelvic floor, diaphragm — is trained through bracing, pelvic tilts, and their progressions.
- Anterior and posterior pelvic tilt are distinguished by predictable patterns of short and long muscles.

- **Safety & scope:**

- Screen for extension-sensitive conditions (OA, facet irritation) before prescribing extension work; keep all exercise pain-free and stage-appropriate.
- Cue continuous breathing, avoid bearing down, and progress only when control is maintained; obtain informed consent and document prescription.

- *Next: Lecture 16 applies these foundations to specific conditions and injuries.*