RUHANI COLLEGE
OF HEALTH BUSINESS AND TECHNOLOGY

RU RMT 19 — REMEDIAL EXERCISE & KINESIOLOGY

Upper Limb — Kinesiology & Remedial Strengthening

Structures, Muscle Actions, and Exercise Prescription

Ruhani College — Registered Massage Therapy (RMT) Diploma Program

Lecture 13 of the Remedial Exercise Series • Full-day delivery (6–7 hours)

Learning Outcomes

By the end of this lecture, the student will be able to:

- Identify the joints and principal muscles of the upper limb relevant to remedial exercise.
- Describe the primary and secondary actions of each muscle group in kinesiologic terms.
- Explain the physiological rationale behind strengthening variables (load, repetitions, sets, tempo).
- Select and instruct appropriate strengthening exercises for the biceps, triceps, deltoids, rotator cuff, serratus anterior, latissimus dorsi, and wrist musculature.
- Apply the concepts of scapular stability and core engagement to safe upper-limb exercise.
- Integrate strengthening and stretching within a balanced, client-centred home-care program.
- Recognize the boundaries of the RMT scope of practice when prescribing exercise (CMTO Standards of Practice).

Structures of the Upper Limb — Joints

Remedial exercise of the upper limb requires an appreciation of the linked chain of joints that share load and movement.

- Glenohumeral (G/H) joint — ball-and-socket; the most mobile and least stable joint in the body. Flexion, extension, abduction, adduction, internal/external rotation, circumduction.
- Scapulothoracic articulation — a functional (not true synovial) joint where the scapula glides on the thorax; provides protraction/retraction, elevation/depression, upward/downward rotation.
- Elbow joint — hinge (humeroulnar and humeroradial); flexion and extension.
- Radioulnar joints (proximal and distal) — pronation and supination of the forearm.
- Wrist (radiocarpal) joint — flexion, extension, radial and ulnar deviation.
- Metacarpophalangeal (MCP) and interphalangeal (PIP/DIP) joints — flexion, extension, and (at MCP) abduction/adduction of the digits.

Clinical note: dysfunction at one joint alters loading up and down the chain — always assess the whole kinetic chain.

Structures of the Upper Limb — Muscles

Primary movers we will address

- Biceps Brachii and Brachialis
- Triceps Brachii
- Deltoid (anterior, middle/medial, posterior)
- Rotator cuff:
  - Supraspinatus
  - Infraspinatus
  - Teres Minor
  - Subscapularis

Scapular & forearm musculature

- Teres Major (functional pairing with subscapularis)
- Latissimus Dorsi
- Serratus Anterior
- Forearm wrist flexors and extensors
- Postural stabilizers referenced later:
  - Trapezius, Pectoralis major/minor, Levator scapulae, Scalenes

These groups rarely act alone — remedial programs address synergists and antagonists together.

Principles of Remedial Strengthening

Before prescribing any exercise, the therapist reasons through why the muscle is being loaded and how.

- Strengthen the surrounding musculature — strengthening is as important as stretching in restoring balance.
- Address postural imbalances that contribute to and cause the presenting pain.
- Look up and down the kinetic chain — consider both stability and range of motion (ROM) proximally and distally.
- Maintain core stability during all exercises; a strong foundation is necessary for all actions.
- Progress ROM logically: active (AROM), active-assisted (AAROM), and self-assisted range.
- Pendulum (Codman) swings for the G/H joint are always a safe, low-load starting choice for mobility.
- Deviating movement patterns stimulates muscle fibres in different ways, promotes balanced development, and helps stave off boredom that reduces focus and intensity.

Exercise Physiology for Prescription

Training variables

- For hypertrophy (muscle size): higher weights with lower repetitions.
- For muscular tone / endurance: lighter weight with higher sets and repetitions.
- Tempo matters — most exercises here cue a slow lift, a 1-second hold, and a slow, controlled return.
- Control over momentum — avoid 'yanking' or swinging the load.

Contraction types (applied throughout)

- Isometric — muscle produces force without changing length; excellent early-stage and for pain-limited joints.
- Isotonic — muscle changes length under load:
  - Concentric (shortening) — e.g., lifting phase of a curl.
  - Eccentric (lengthening) — e.g., lowering phase; exposes the tendon to greater load.
- *Progression principle: begin isometric, then isotonic against gravity, then add resistance.*

Biceps Brachii — Anatomy & Function

- A two-headed muscle of the anterior arm (long head and short head) crossing both the G/H and elbow joints.
- Primary function: elbow flexion.
- Secondary function: supination of the forearm.
- Weak assistant in G/H (shoulder) flexion.
- Brachialis lies deep to biceps and is a pure, powerful elbow flexor — targeted when the forearm is in a neutral (thumb-up) grip.
- Because biceps crosses two joints, position of the shoulder influences its length-tension relationship at the elbow.
- Program design: vary hand position and shoulder angle to stimulate the biceps complex through different ranges and promote balanced development.

Biceps Brachii — Barbell Curls

A foundational elbow-flexion strengthening exercise.

- Seated or standing, hands supinated, feet shoulder-width apart.
- Start with the barbell held in both hands, arms extended.
- Slowly curl the bar up toward the shoulders, keeping the elbows tucked to the sides.
- Hold for 1 second at the top of the movement.
- Slowly lower back down under control (emphasize the eccentric phase).
- Can also be performed with resistance bands or kettlebells for progression or home use.

Cue: keep wrists neutral and avoid trunk sway — momentum reduces the therapeutic load on the biceps.

Biceps Brachii — Hammer Curls

A variation that increases focus on the brachialis.

- Standing, seated, or supine — the key is a neutral grip (thumb pointed up toward the ceiling).
- Feet shoulder-width apart; use dumbbells (single-arm weight) rather than a barbell so each arm works independently.
- Slowly curl the weights up toward the shoulder.
- Hold for 1 second, then slowly bring the weight back down.
- Can also be performed with kettlebells or resistance bands.
- Because the forearm stays neutral, the brachialis and brachioradialis contribute more than in a supinated curl.

Useful when a supinated grip is provocative (e.g., certain elbow or wrist presentations).

Biceps Brachii — Additional Exercises

Free-weight & cable variations

- Incline / decline dumbbell curls — change the shoulder angle to alter biceps length-tension.
- Cable curls — provide constant tension through the range.
- Bent-over barbell rows — biceps assists a larger back-and-arm pulling pattern.

Compound & bodyweight

- Chin-ups — supinated grip; strong biceps and lat involvement.
- Clean and jerk — advanced, whole-body power movement recruiting the biceps within a chain.
- *Selection guidance: match the exercise to the client's ability, equipment, and goals; regress to bands or isometrics when needed.*

Triceps Brachii — Anatomy & Function

- A three-headed muscle of the posterior arm (long, lateral, and medial heads).
- Primary functions: elbow extension and (via the long head) G/H extension.
- The long head crosses the shoulder, so G/H extension exercises also involve and target the posterior deltoid and latissimus dorsi.
- Antagonist to the biceps at the elbow — balanced elbow strength requires attention to both.
- Functionally essential for pushing tasks (pressing, stabilizing the loaded elbow).
- Clinical relevance: weakness or fatigue of the triceps shifts stabilizing demand onto the elbow and shoulder.

Triceps Brachii — Pushdowns

A controlled elbow-extension exercise using a cable or band.

- Standing or seated.
- Uses a rope or resistance band anchored above.
- Begin with elbows bent and tucked close to the body, fists close to the chest.
- Push the hands down by extending the arms until the hands touch the front of the thighs.
- Pause for 1 second, then slowly return to the starting position.

Keeping the elbows pinned to the sides isolates the triceps and limits shoulder substitution.

Triceps Brachii — Close-Grip Push-Up

A bodyweight exercise emphasizing the triceps.

- Start in the same position as a regular push-up.
- Place the hands closer together, roughly within shoulder width.
- Keep the hands in and tuck the elbows toward the body during the descent and press.
- This hand and elbow position recreates higher patterns of muscle activity in both the triceps and the pectorals.
- Regress to a wall or incline (hands elevated) push-up to reduce load; progress toward the floor as strength improves.

Maintain a neutral spine and engaged core throughout — no sagging at the hips.

Triceps Brachii — Additional Exercises

Extension-based

- Dips — bodyweight or supported; strong triceps and anterior chest demand.
- 'Skullcrushers' (lying triceps extensions) — isolate the elbow extensors.
- Seated triceps dumbbell extensions (overhead) — load the long head in a lengthened position.

Cable / posterior emphasis

- Cable kick-back — controlled, low-load elbow extension useful for endurance and re-education.
- Overhead positions bias the long head; elbows-at-side positions bias the lateral/medial heads.
- *Choose variations that respect the client's shoulder comfort — overhead loading may be provocative in impingement.*

Deltoids — Anatomy & Function

- Three functional portions: anterior, middle (medial), and posterior fibres.
- As a group, the deltoid is the prime mover of G/H abduction.
- Anterior fibres: G/H flexion and internal rotation.
- Middle fibres: pure abduction (most active between ~15° and 90°+).
- Posterior fibres: G/H extension and horizontal abduction (and external rotation assist).
- Strong deltoid muscles support the humeral head and help prevent dislocation when carrying heavy loads.

General strengthening cue: strengthen the group with abduction while maintaining external rotation (thumbs up toward the ceiling) to protect the subacromial space.

Deltoids — Targeting Anterior vs Posterior

Anterior deltoid focus

- Move into G/H flexion — e.g., an overhead press.
- Also engaged during front raises (with medial deltoid).
- Involved in pushing/pressing patterns.

Posterior deltoid focus

- Move into G/H horizontal abduction — e.g., reverse flies — and G/H extension.
- When performing reverse-fly motions, keep the G/H externally rotated.
- *Posterior deltoid is often under-trained relative to the anterior chain and matters for postural balance.*

Deltoids — Lateral Raises

- Helps target all deltoid groups with more focus on the medial (middle) deltoid.
- Seated or standing.
- Grasp the weights and raise the arms up to shoulder level and then overhead.
- Keep the palms facing down at the top of the movement.
- Control both the lift and the lowering; avoid shrugging (upper trapezius substitution).

For clients with impingement, limit the arc and keep the thumbs slightly up to reduce provocation.

Deltoids — Bent-Over Laterals

- Helps target the posterior and medial deltoid more.
- Seated, standing, or prone.
- Lean forward from the hips until the chest is either parallel to the ground or pressed onto the thighs.
- Bend the elbows slightly and keep the thumbs up.
- Swing/raise both dumbbells out and up to shoulder level.

Keep the neck long and the spine neutral; hinge at the hips rather than rounding the back.

Deltoids — Front Raises

- Helps target the anterior and medial deltoid muscles more.
- Seated or standing.
- Grasp the weights and place them over the thighs.
- Raise one arm up to slightly above shoulder level, lower, and repeat with the other arm.
- Keep the thumbs pointed toward the centre of the body (palms down).

Alternating arms allows better control and reduces trunk compensation.

Deltoids — Additional Exercises

Pressing & pulling

- Standing dumbbell press — overhead, anterior/medial emphasis.
- Neutral-grip chin-ups — recruit posterior deltoid within a pulling pattern.

Isolation & tools

- Prone reverse flies — posterior deltoid, spine unloaded.
- Kettlebell raises — offset load challenges control and stability.
- *Always pair deltoid strengthening with rotator-cuff work so the head stays centred in the glenoid.*

Supraspinatus — Anatomy & Function

- One of the four rotator-cuff muscles; runs from the supraspinous fossa of the scapula, under the acromion, to the greater tubercle of the humerus.
- Initiates G/H abduction — responsible for the first ~10–15° of abduction before the deltoid takes over.
- Helps compress and centre the humeral head in the glenoid throughout abduction.
- Because the deltoid quickly overpowers it, deltoid exercises engage the supraspinatus only briefly.
- Its position under the acromion makes it vulnerable to impingement — technique matters greatly (see next slide).

Supraspinatus — Technique & Exercise

Position of safety

- Keep the thumb up toward the ceiling — the 'full can' position.
- Avoid the 'empty can' (thumb-down) position, which places the shoulder in impingement.
- Full can preserves subacromial space and protects the tendon.

Broomstick / cane exercises

- Brooms and sticks are excellent for assisting motions with this muscle.
- To stretch: pull the broomstick away from the affected side.
- To strengthen: resist moving the broom toward the affected side.
- *Low load and self-assisted — ideal early-stage home tools.*

Rotator Cuff — Overview of the Four Muscles

The rotator cuff dynamically stabilizes the G/H joint by centring the humeral head in the glenoid.

- Supraspinatus — initiates abduction (covered previously).
- Infraspinatus — external rotation.
- Teres Minor — external rotation (works with infraspinatus).
- Subscapularis — internal rotation.
- Teres Major (not a true cuff muscle but paired functionally) — internal rotation, extension, and adduction.
- Exercises can be performed sidelying, standing, seated, or prone.
- Positioning: with the arm at the side, or with the arm abducted to 90°.

Rotator Cuff — Strengthening & Stretching

Infraspinatus & Teres Minor (external rotators)

- To strengthen — resist external rotation.
- To stretch — move into internal rotation.
- *Strengthening these also stretches the internal rotators (subscapularis / teres major).*

Subscapularis & Teres Major (internal rotators)

- To strengthen — resist internal rotation.
- To stretch — move into external rotation.
- Subscapularis / teres major are often injured in activities with a throwing motion.
- *Strengthening these also stretches the external rotators.*

Rotator Cuff — Applying the Actions

Practical set-up for external-rotator strengthening (and internal-rotator stretch).

- Band or dumbbell external rotation with the arm at the side and the elbow flexed to 90°, elbow tucked to the ribs.
- Sidelying external rotation with a light dumbbell isolates the infraspinatus/teres minor.
- Progress toward the arm abducted to 90° only when the joint tolerates it.
- For internal-rotator strengthening, reverse the band direction (resist internal rotation).
- Keep loads light and repetitions higher — the cuff is an endurance stabilizer, not a prime mover.

Quality over quantity: precise, controlled rotation beats heavy loading for cuff re-education.

Serratus Anterior — Anatomy & Function

- Originates from the upper ribs and inserts on the medial border of the scapula (costal surface).
- Helps with protraction and upward rotation of the scapula.
- Keeps the scapula flat against the rib cage — a strong serratus prevents scapular 'winging.'
- Upward rotation of the scapula improves proper mechanics for G/H movement and helps reduce impingement issues.
- Weakness (often paired with a forward-head/rounded posture) contributes to winging and altered shoulder rhythm.

A key player in scapulohumeral rhythm — essential for pain-free overhead reach.

Serratus Anterior — Push-Up Plus

The signature serratus-anterior exercise.

- Like a regular push-up but with a slight variation.
- Assume the push-up position.
- Keeping proper form, protract the scapulae together (spread the shoulder blades apart at the top) without bending the arms, flexing the head forward, or bending at the hips.
- Hold for 1 second, release, and repeat.
- This 'plus' at the top is the extra scapular protraction that drives the serratus.

Regress to a wall or incline push-up plus for deconditioned clients or acute presentations.

Serratus Anterior — Isolation & Other Exercises

Dumbbell Punch

- Supine, knees bent, feet flat on the floor.
- Hold a weight in both hands and extend it vertically above the chest.
- Push the weight more vertical while focusing on protracting the scapula.
- Hold for 1 second, release, then repeat.

Isolation cue & other options

- To isolate serratus, instruct the client to press back firmly into the backrest and isolate the protraction/retraction aspect of the muscle's action.
- Wall push-ups.
- Incline press.
- Dumbbell incline shoulder raise.

Latissimus Dorsi — Anatomy & Function

- A broad muscle of the back spanning from the thoracolumbar fascia and lower ribs to the humerus.
- Responsible for G/H extension, adduction, and internal rotation — the combined 'handcuff' position.
- A strong, developed latissimus dorsi makes the waist look smaller than the shoulders (the 'V' taper).
- Typically used in many rowing and pulling motions — sometimes called the 'climbing' muscle.
- Because it crosses the shoulder and attaches near the pelvis via the fascia, it links the upper limb to the trunk.

Overactivity/tightness can contribute to internal-rotation posture at the shoulder — balance pulling with mobility.

Latissimus Dorsi — Dumbbell Rows

- Standing or seated.
- Try to keep the back flat and engage the core.
- Hold the weight, bend the elbows to 90°, and keep them tucked to the side of the body.
- Focus on using the back muscles to control the movement — do not 'yank' the weights up.
- Draw the shoulder blade toward the spine (retraction) as the elbow drives back.

A single-arm bench-supported row unloads the spine and is a good regression.

Latissimus Dorsi — Additional Exercises

Pulling patterns

- Lat pulldowns (cable) — vertical pulling; scalable load.
- Band pull-downs / straight-arm pulldowns — home-friendly.
- Bent-over rows and cable rows — horizontal pulling.

Bodyweight & functional

- Prone (floor) 'swimmer' and extension holds.
- Renegade rows / plank rows — combine pulling with core stability.
- Kneeling or standing band rows anchored to a door.
- *Balance all pulling with anterior mobility work to avoid reinforcing an internally rotated posture.*

Wrist Flexors & Extensors — Anatomy & Function

- Forearm flexors (anterior compartment) produce wrist flexion; extensors (posterior compartment) produce wrist extension.
- Together they also contribute to radial/ulnar deviation and grip.
- Their tendons attach near the medial and lateral epicondyles — the sites of golfer's and tennis elbow (Lecture 14).
- Grip strength and forearm endurance are frequently deconditioned in desk and repetitive-strain populations.
- Balanced flexor and extensor strength protects the wrist and elbow from overuse.

Wrist Flexors & Extensors — Exercises

- Wrist curls (flexion) and reverse wrist curls (extension) with a light dumbbell or band, forearm supported.
- Wrist flexion/extension against a resistance band held under the foot or anchored.
- Barbell or bar rotations and radial/ulnar deviation drills for balanced control.
- Grip work — therapy putty, stress balls, and graded gripper tools.
- Isometric holds and prayer-position stretches for flexors/extensors.
- Wrist roller (weight on a cord) for endurance of both compartments.

Keep loads light and repetitions higher; forearm tissue responds well to endurance dosing.

Scapular Stability — Why It Matters

Reference: Kinesiology & clinical texts (e.g., K&C, p. 485).

- The interaction between the scapula, thoracic region, and humerus is very important in preventing and rehabilitating neck and shoulder injuries.
- A stable, well-positioned scapula gives the G/H muscles a firm base from which to act.
- Poor scapular control alters scapulohumeral rhythm and predisposes to impingement, cuff overload, and neck pain.
- Remedial programs therefore address scapular position and control alongside G/H strengthening.

Example presentation (next slide): hyperkyphosis with anterior head carriage.

Scapular Stability — Postural Example

If a person has hyperkyphosis with an anterior head carriage, they will also present with a scapula tilted anteriorly. This results in:

- Decreased flexibility in pectoralis minor, levator scapulae, and scalenes.
- Weakness in serratus anterior (winging) and the upper trapezius.
- The humerus positioned in abduction and internal rotation relative to the glenoid fossa.
- G/H internal rotators (subscapularis, teres major) become less flexible.
- G/H external rotators (infraspinatus, teres minor) become weak.

Remedial goal: lengthen the tight anterior/upper structures and strengthen the weak serratus and external rotators to restore scapular position.

Stability Exercises — Core & Scapular

Performing exercises/movement patterns for a specific region (e.g., scapula, hip) requires the stabilization and engagement of core muscles to accomplish it.

- Planks and dead bugs — foundational trunk stability.
- Push-up plus — scapular protraction with core control.
- Bird dog — contralateral limb control over a stable spine.
- 1-arm bottoms-up kettlebell carry walk — challenges cuff, scapular, and core stability together.
- Turkish get-up — integrated whole-body stability under an overhead load.

Stability is trained before, and alongside, heavier strengthening — control precedes load.

Putting It Together — Program Design

When assembling an upper-limb remedial program, remember:

- Address the postural imbalances contributing to and causing the pain.
- Strengthening the surrounding musculature is as important as stretching it.
- Look up and down the chain — consider both stability and ROM.
- Don't forget core stability while doing all exercises.
- A strong foundation is necessary for all actions.
- Progress ROM: active, active-assisted, self-assisted.
- Pendulum swings for the G/H are always a great choice for gentle mobility.

Scope, Consent & Home-Care Delivery

Prescribing remedial exercise is a clinical act performed within the RMT scope.

- Ground prescription in assessment findings, not a generic template.
- Obtain informed consent for a home program and confirm the client understands each exercise.
- Teach, observe a return demonstration, and provide clear written/illustrated instructions.
- Dose within pain-free tolerance and progress gradually; document what was prescribed.
- Refer or collaborate when presentation is outside RMT scope (e.g., red-flag signs, suspected fracture, neurological deficit).

Practise in accordance with the CMTO Standards of Practice and professional judgement.

Summary — Lecture 13

- The upper limb is a linked chain of joints; effective remedial exercise considers the whole chain and the scapular base.
- Each muscle group has defined actions that dictate how to strengthen it and how to stretch its antagonist.
- Training variables (load, reps, sets, tempo) and contraction type are chosen to match the client's goal and irritability.
- The rotator cuff and deltoid form a force couple; the serratus and scapular stabilizers set the platform for shoulder function.
- Postural imbalance (e.g., hyperkyphosis/forward head) produces predictable muscle imbalances that guide the program.
- Core and scapular stability underpin every upper-limb exercise — control precedes load.

Next: Lecture 14 applies these principles to common upper-limb conditions and injuries.

References & Sources for Verification

The following require verification against current editions and regulatory sources before clinical or examination use:

- Kinesiology / clinical massage therapy text (scapular stability, p. 485 as cited in source materials).
- Rotator-cuff tendinopathy and eccentric loading literature (e.g., Murtaugh & Ihm, 2013) — carried into Lecture 14.
- CMTO Standards of Practice and Scope of Practice (current version) — for exercise prescription boundaries and documentation.
- CMTCA competency and accreditation standards — for alignment of remedial exercise content.
- Current anatomy and exercise-physiology references for muscle actions and training variables.

Instructor note: confirm all cited page numbers, dates, and regulatory wording against the latest sources prior to delivery.