

VIBEMOTION LABS · ATHLETE RECOVERY

SPECIFIC INJURY PROGRAMME

# ACL Reconstruction

## *Recovery Programme*

Free

Complete 9–12 month programme from surgery to elite athletic performance. Covers all five phases: acute protection, early mobility, strength building, plyometric power, and full return to sport — with every exercise, set, rep, load, how-to instruction, and coaching cue. Always follow your surgeon and physiotherapist's specific guidance.

UNDERSTANDING YOUR ACL INJURY

### What is the ACL?

The Anterior Cruciate Ligament (ACL) is one of the four major knee ligaments. It runs diagonally through the middle of the knee and controls rotational movement and forward movement of the tibia relative to the femur. ACL tears typically occur during sudden deceleration, pivoting, landing from a jump, or direct contact.

### ACL Graft Types

GRAFT TYPE	SOURCE	KEY CONSIDERATION
Patellar Tendon (BTB)	Middle third of patellar tendon with bone plugs	Gold standard for high-demand athletes. Strongest fixation.
Hamstring (ST/G)	Semitendinosus and gracilis tendons	Less donor site pain. Slightly longer biological incorporation.
Quadriceps Tendon	Central quadriceps tendon	Increasing popularity. Strong, less anterior knee pain.
Allograft	Cadaveric donor tissue	Longer healing. Common in older or lower-demand athletes.

OVERALL RECOVERY TIMELINE

PHASE	FOCUS	CLEARANCE CRITERION
Phase 1 — Weeks 0–2	Acute protection, swelling control, quad activation	Walk without crutches, minimal swelling
Phase 2 — Weeks 2–6	ROM restoration, early strengthening	Full ROM, 60% quad strength vs. other side
Phase 3 — Weeks 6–16	Progressive strength, LSI to 70%	Single-leg squat, LSI $\geq$ 70%
Phase 4 — Months 4–7	Plyometrics, running, power	LSI $\geq$ 90% on hop tests, running 75%+
Phase 5 — Months 7–12	Return to full sport, elite performance	Full sport clearance, LSI $\geq$ 95%

■ ACL SAFETY RULES — READ BEFORE STARTING

1. Never progress to the next phase without meeting ALL clearance criteria for the current phase. 2. Pain during any exercise above 3/10 means STOP — rest and reassess. 3. Swelling after exercise that does not resolve within 24 hours = reduce load immediately. 4. Do not run until your surgeon explicitly clears you (typically week 12–16 minimum). 5. Do not return to cutting, pivoting, or sport until Phase 5 clearance criteria are met. 6. Psychological readiness is as important as physical clearance — never rush.

## PHASE 1

## Acute Protection and Quad Re-Activation

Goal: Reduce swelling, restore quad control, achieve full knee extension

Timeline: Weeks 0–2

Key Focus: The most common long-term problem after ACL surgery is quad weakness. Every day in this phase is about re-establishing the neural connection to your quadriceps.

### 01 Quad Set / Isometric Quad Contraction

Quadriceps  
Activation

SETS	REPS / TIME	LOAD	TEMPO	REST
3	15 reps x 10 sec hold	Bodyweight	10 sec on / 5 sec off	60 sec

#### HOW TO PERFORM

1. Lie on your back or sit with your operated leg extended straight on a firm surface.
2. Place a small rolled towel under the back of your knee to achieve a slight 10-15° bend.
3. Tighten your thigh muscle by pressing the back of your knee firmly down into the towel.
4. You should see the quad muscle contract and feel your kneecap rise slightly.
5. Hold the contraction for 10 full seconds — breathe steadily, do not hold breath.
6. Completely relax for 5 seconds between each rep — confirm the muscle has fully let go.
7. Focus: this is the most important early exercise. Quad inhibition after ACL surgery is real and must be fought from day one.

#### COACHING CUES

- *Press down into the towel — the force goes straight through the knee.*
- *Compare the quad contraction to your uninjured side — work toward symmetry.*
- *If you feel nothing in the quad, try the uninjured side first to find the sensation.*

#### PROGRESS WHEN

When you can feel a strong, visible quad contraction for all 15 reps.

■ *Sharp, electrical pain means stop and contact your surgeon.*

### 02 Ankle Pumps and Circles

Circulation / DVT  
Prevention

SETS	REPS / TIME	LOAD	TEMPO	REST
3	20 pumps + 10 circles each direction	Bodyweight	Slow and controlled	30 sec

HOW TO PERFORM

1. Lie on your back with legs slightly elevated on a pillow.
2. Slowly flex your foot — pull toes toward your shin — then point it away.
3. Each pump takes 2 seconds up and 2 seconds down.
4. After 20 pumps, trace slow circles with your foot — 10 clockwise, 10 counterclockwise.
5. Perform this 3–4 times per day, especially when you have been sitting or lying still for extended periods.

COACHING CUES

- *This is not just mobility work — it is DVT (blood clot) prevention. Do not skip it.*
- *If you feel calf pain, tightness, or unusual swelling in the lower leg, contact your surgeon immediately.*

PROGRESS WHEN

Continue daily throughout the entire first 4 weeks regardless of phase.

- *Calf pain or significant lower leg swelling requires urgent medical assessment.*

## 03 Heel Slides (Knee Flexion ROM)

Knee Flexion  
Range of Motion

SETS	REPS / TIME	LOAD	TEMPO	REST
3	12 reps	Bodyweight	Slow and controlled	45 sec

HOW TO PERFORM

1. Lie flat on your back on a firm surface with both legs straight.
2. Keeping your heel on the surface, slowly slide your operated leg heel toward your buttocks.
3. Bend as far as comfortable — never push into sharp pain.
4. Hold at end range for 3 seconds, feeling a gentle stretch.
5. Slowly slide back to straight, noting the angle achieved.
6. Goal progression: Week 1 target 90°. Week 2 target 110°+.

COACHING CUES

- *Compare range to your uninjured side at each session — note the difference.*
- *Swelling is the enemy of ROM — ice after this exercise every time.*
- *Do not use your hands to force the knee — gravity and muscle only.*

PROGRESS WHEN

When you reach 90° flexion pain-free — then push toward 110°.

- *Never force range of motion in the first 2 weeks — graft protection is the priority.*

## 04 Straight Leg Raise

Quad Strength /  
Hip Flexor

SETS	REPS / TIME	LOAD	TEMPO	REST
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3	15 reps	Bodyweight → 1–2 kg ankle weight	2 sec raise / 2 sec lower	60 sec
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## HOW TO PERFORM

1. Lie on your back. Bend your uninjured knee with foot flat. Keep operated leg straight.
2. Tighten your quad on the operated leg — actively lock the knee straight before lifting.
3. Keeping the knee locked straight, raise the leg to the height of the bent knee (approx 45°).
4. Hold for 2 seconds at the top.
5. Lower slowly over 2 seconds — resist gravity all the way down.
6. If the knee bends during the lift, lower the leg and reset — the quad must be locked before and during lifting.

## COACHING CUES

- *The quad MUST be contracted before the leg leaves the surface.*
- *If you feel a painful clunk or giving in the knee during the SLR, stop and contact your physio.*
- *Progress to a 1 kg ankle weight only when 3×15 bodyweight is easy and pain-free.*

## PROGRESS WHEN

When 3×15 with 2 kg ankle weight is pain-free and knee stays locked throughout.

## PHASE 1 COMPLETION CRITERIA

- Resting pain 0–1/10 consistently for 3+ consecutive days
- Able to perform straight leg raise with locked knee — no extensor lag
- Swelling classified as minimal — can see knee definition
- Walking independently without crutches on flat ground (if surgeon cleared)
- Full passive knee extension equal to uninjured side

PHASE 2

# Mobility Restoration and Early Strengthening

Goal: Achieve full ROM, begin bilateral loading, reach 60% quad symmetry

Timeline: Weeks 2–6

## 05 Terminal Knee Extension (TKE) with Band

Quad / VMO Strength

SETS	REPS / TIME	LOAD	TEMPO	REST
3	15 reps	Light resistance band behind knee	2 sec extension / 2 sec return	60 sec

HOW TO PERFORM

1. Anchor a resistance band to a fixed point at knee height. Step into the band so it sits behind your operated knee.
2. Stand facing the anchor with feet shoulder-width apart. The band should pull your knee slightly forward.
3. Start with your knee bent approximately 30°.
4. Actively straighten your knee to full extension by contracting your quad firmly.
5. Pause at full extension for 2 seconds — feel the VMO (inner quad) activate.
6. Slowly return to 30° bend over 2 seconds.
7. This exercise specifically targets the VMO and terminal extension — the exact range where ACL patients lose strength.

COACHING CUES

- *Feel for activation on the inner side of your kneecap — that is the VMO.*
- *Do not hyperextend — stop at neutral extension.*
- *Higher band resistance = more challenge. Increase only when 3x15 feels effortless.*

PROGRESS WHEN

When 3x15 with medium band is pain-free and full extension is consistently achieved.

## 06 Mini Squat (0–45°)

Bilateral Quad / Glute

SETS	REPS / TIME	LOAD	TEMPO	REST
3	12 reps	Bodyweight → light dumbbell	3 sec down / 1 hold / 2 up	75 sec

HOW TO PERFORM

1. Stand with feet hip-width apart, hands on a wall or chair for initial support.
2. Slowly lower your body by bending both knees — go only to 45° in weeks 2–4.

3. Keep your weight evenly distributed between both feet.
4. Ensure the operated knee tracks over the second toe — watch in a mirror.
5. Hold at 45° for 1 second.
6. Push evenly through both heels to return to standing.
7. Progress from 45° to 60° in weeks 4–5, to 90° in weeks 5–6 as pain allows.

## COACHING CUES

- *Monitor swelling after every session — increased swelling means reduce depth.*
- *Equal weight through both feet at all times — resist the urge to offload the operated side.*
- *Track depth progress each session — this is your primary ROM benchmark.*

## PROGRESS WHEN

When 3×12 at 90° is pain-free and symmetric — move to single-leg work.

■ *Stop if you feel sharp kneecap pain or significant grinding sensations.*

## 07 Prone Hamstring Curl

Hamstring  
Strength

SETS	REPS / TIME	LOAD	TEMPO	REST
3	12 reps per leg	Bodyweight → 1–2 kg ankle weight	2 sec up / 2 sec down	60 sec

## HOW TO PERFORM

1. Lie face down with both legs straight. A pillow under the hips reduces lumbar extension strain.
2. Slowly bend the operated knee, lifting the heel toward your buttocks using only your hamstring.
3. Lift to the point of pain-free range — note the angle each session.
4. Hold at the top for 2 seconds.
5. Lower slowly over 2 seconds.
6. Begin with the uninjured leg first to establish the target range.
7. For the operated leg, lift only within pain-free range — do not pull with your hand.

## COACHING CUES

- *Hips stay flat on the surface — pelvis should not rotate.*
- *A mild pulling sensation in the back of the thigh is normal. Pain is not.*
- *Hamstring strength is critical for ACL graft protection — prioritise this exercise.*

## PROGRESS WHEN

When 3×12 with 2 kg ankle weight is pain-free — progress to standing curl.

## PHASE 3

## Progressive Strength Building

Timeline: Weeks 6–16

Goal: Reach LSI  $\geq$  70%, single-leg loading, full functional movement

### 08 Bulgarian Split Squat

Quad / Glute /  
Single-Leg  
Strength

SETS	REPS / TIME	LOAD	TEMPO	REST
4	10 reps per leg	Start: bodyweight · Progress to: 15–25 lb dumbbells	3 sec down / 1 hold / 2 up	90 sec

## HOW TO PERFORM

1. Stand 2 feet in front of a bench or step. Place your rear foot on top of it, laces down.
2. Your front foot (operated leg leading) should be far enough forward that your knee does not travel past your toes.
3. Lower your body by bending your front knee — aim for front thigh parallel to floor.
4. Keep your torso upright — do not lean forward.
5. Your rear knee lowers toward the floor but does not touch it.
6. Drive through the heel of your front foot to return to starting position.
7. Begin with the operated leg as the FRONT leg so it does the majority of the work.

## COACHING CUES

- *This exercise creates high quad demand on the front leg — this is intentional.*
- *Watch for knee valgus (caving inward) — if it occurs, reduce the weight.*
- *Compare rep quality and depth between both legs each session.*

## PROGRESS WHEN

When 4×10 with 25 lb dumbbells is pain-free and symmetric — begin goblet squats.

■ *Do not perform if you have significant swelling post-session.*

### 09 Romanian Deadlift (Single-Leg)

Hamstring / Glute /  
Posterior Chain

SETS	REPS / TIME	LOAD	TEMPO	REST
3	8 reps per leg	Start: 15 lb dumbbell · Progress: 5 lb per week	3 sec hinge / 1 hold / 2 up	90 sec

## HOW TO PERFORM

1. Stand on your operated leg with a slight bend in the knee. Hold a dumbbell in the opposite hand.
2. Push your hips backward while hinging forward — let the dumbbell slide down the front of the standing leg.

3. Keep your back perfectly flat — imagine a broomstick from head to tailbone.
4. Lower until you feel a strong hamstring stretch — typically when your torso is near parallel to the floor.
5. Hold for 1 second at the bottom.
6. Drive your hips forward to return to standing — squeeze the glute firmly at the top.
7. The non-standing leg lifts behind you as a counterbalance — keep it level with your back.

## COACHING CUES

- *Hip hinge movement — not a squat. Knees have only a slight bend.*
- *If you feel unstable, practise near a wall and touch it lightly for balance.*
- *Compare the hamstring stretch sensation between both sides — aim for symmetry.*

## PROGRESS WHEN

When 3×8 per leg with 25 lb is pain-free and balanced.

## 10 Nordic Hamstring Curl

Eccentric  
Hamstring — ACL  
Protection

SETS	REPS / TIME	LOAD	TEMPO	REST
3	6 reps	Bodyweight eccentric — partner holds ankles	5 sec slow lower / push-up return	120 sec

## HOW TO PERFORM

1. Kneel on a padded mat. Have a partner hold your ankles firmly to the floor. Keep body straight, knees to shoulders.
2. Cross arms over chest or extend them forward.
3. Begin falling forward by slowly extending both knees — resist the fall as long as possible.
4. Your hamstrings control the descent — this is a 5-second slow lowering.
5. When you can no longer resist, catch yourself on your hands.
6. Push back to the starting position with your hands — the return is completely assisted.
7. Focus: slower lowering each session = stronger hamstrings = better ACL protection.

## COACHING CUES

- *This exercise has the strongest evidence base of any ACL prevention exercise — do not skip it.*
- *DOMS (delayed onset muscle soreness) after first session is guaranteed and significant — this is normal.*
- *Goal is not more reps — it is a slower, more controlled lowering each session.*

## PROGRESS WHEN

When you can lower for 5 full seconds for 3×6 — add a resistance band or weighted vest.

■ *Do not perform within 48 hours of heavy leg session — allow full hamstring recovery.*

PHASE 4

# Plyometrics, Running and Power

Goal: LSI ≥ 90% on all hop tests, running at 75%+ speed, sport-specific movement

Timeline: Months 4–7

■ *Do not begin Phase 4 until surgeon has given explicit running clearance (typically 12–16 weeks minimum).*

## 11 Bilateral Box Jump with Stick Landing

Explosive Power / Landing Mechanics

SETS	REPS / TIME	LOAD	TEMPO	REST
3	6 reps	Bodyweight · Box height: 12" → 18"	Max effort / stick 2 sec	2–3 min

HOW TO PERFORM

1. Stand 12 inches in front of a box, feet hip-width apart, slight quarter-squat.
2. Swing arms explosively and jump onto the box with both feet simultaneously.
3. Land on the balls of both feet and absorb through ankles, knees, and hips.
4. Stick the landing completely still for 2 full seconds — knees must stay aligned over toes.
5. Step back down — never jump down — and reset for the next rep.
6. Focus on landing quality before increasing height.

COACHING CUES

- *Silent landings = good mechanics. Loud landings = joint stress.*
- *Both knees must track over toes on landing — watch in mirror for valgus.*
- *Do not progress to single-leg until bilateral form is perfect for 3 consecutive sessions.*

PROGRESS WHEN

When 3x6 at 18" with consistently controlled, silent landings.

■ *Skip this exercise if any residual swelling or pain above 2/10.*

## 12 ACL Return-to-Running Protocol

Running Mechanics / Cardiovascular

SETS	REPS / TIME	LOAD	TEMPO	REST
5 days/ week	Progressive schedule	Bodyweight	See weekly schedule	Per session

HOW TO PERFORM

1. Week 1: Walk 3 min / Jog 1 min × 6 intervals. Pain must be 0/10 throughout and after.
2. Week 2: Walk 2 min / Jog 2 min × 6 intervals.
3. Week 3: Walk 1 min / Jog 3 min × 6 intervals.
4. Week 4: Jog 20 minutes continuously at 60% effort.
5. Week 5: Run 20 minutes at 70% effort with mild directional changes in final 5 min.
6. Week 6: Run 25 minutes at 75–80% effort with 45° cutting movements.
7. Stop and reassess if pain exceeds 2/10 at any point during any session.

#### COACHING CUES

- *Run on a flat, forgiving surface — avoid camber (sloped roads) until Phase 5.*
- *Midfoot strike reduces impact forces significantly vs. heel striking.*
- *If a session produces swelling that persists 24 hours, repeat that week before advancing.*

#### PROGRESS WHEN

When 25-minute run at 80% with directional changes is pain-free.

■ *Do not begin this protocol without surgeon's explicit clearance.*

PHASE 5

# Return to Elite Athletic Performance

Timeline: Months 7–12+

Goal: LSI ≥ 95%, full sport participation, long-term prevention in place

## 13 5-10-5 Shuttle with Reactive Cue

Sport Speed /  
Change of  
Direction

SETS	REPS / TIME	LOAD	TEMPO	REST
4	6 reps	Bodyweight — timed	Max effort	Full recovery 2–3 min

HOW TO PERFORM

1. Mark three lines 5 yards apart with cones.
2. Start at the middle cone in an athletic two-point stance.
3. Sprint to the right cone (5 yards), touch the line with your right hand.
4. Sprint to the far left cone (10 yards), touch with your left hand.
5. Sprint back through the start line (5 yards).
6. Record time. Target: within 10% of pre-injury personal best.
7. Reactive version: partner points left or right at the moment you start — you react and go that direction first.

COACHING CUES

- *The change of direction should come from a hard plant foot, not a rounded loop.*
- *Your operated leg will likely be your dominant change-of-direction leg — monitor confidence carefully.*
- *This is also a psychological readiness test — hesitation or guarding means you are not ready.*

PROGRESS WHEN

When 6 reps are completed at pre-injury speed with zero hesitation or guarding.

## 14 ACL Prevention Maintenance Programme

Lifelong Injury  
Prevention

SETS	REPS / TIME	LOAD	TEMPO	REST
2 days/ week pe rmanent ly	See protocol	Various	As prescribed	As prescribed

HOW TO PERFORM

1. This programme does NOT end at return to sport. It continues for your entire athletic career.
2. Nordic Hamstring Curl: 2×6 reps, once per week, every week you are training.

3. Single-leg balance on unstable surface: 2×45 sec per side, 2× per week.
4. Lateral band walk: 2×20 steps each direction, every warm-up.
5. Lateral hop and stick: 3×5 reps per side, twice weekly.
6. Hip 90/90 mobility: 2×60 sec each side, daily.
7. If you miss more than 2 weeks of training for any reason — restart this programme from week 1.

#### COACHING CUES

- *ACL re-injury rate without prevention programme: 20–25% within 2 years of return.*
- *ACL re-injury rate WITH a structured prevention programme: reduced to 4–6%.*
- *Share this programme with your coach — prevention is a team effort.*

#### PROGRESS WHEN

This programme never ends — it evolves with your training demands.

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## ACL RETURN TO SPORT — FINAL CLEARANCE CHECKLIST

All items must be confirmed before unrestricted return to competition:

- Minimum 9 months post-surgery (biological graft maturation, not just rehabilitation)
- LSI  $\geq$  95% on triple hop for distance — tested on 2 separate days
- LSI  $\geq$  95% on single-leg leg press at matched load
- 5-10-5 shuttle within 10% of pre-injury time
- 2 full sport-specific training sessions at 100% intensity — pain-free during and after
- Fear of re-injury score  $\leq$  3/10 (self-rated Kinesiophobia scale)
- Nordic hamstring curl: 5-second lowering for 3x6
- Written clearance from surgeon AND physiotherapist
- ACL prevention programme integrated into weekly training
- Coach briefed on return-to-play plan and graduated reintroduction