

Normalization of Strength/length Curve Protocol

Phase 1

Goals

1. Protect healing tissue
2. Minimize atrophy and strength loss
3. Prevent motion loss

Protection

Avoid excessive active or passive lengthening of the hamstrings
Avoid antalgic gait pattern

Ice

2-3 times daily

Therapeutic exercise (performed daily)

1. Stationary bike
2. Sub maximal Isometric at 3 angles (100°, 45°, 20°)
3. Single leg balance
4. Balance Board
5. Soft tissue mobilization/Instrument assisted STM
6. Pulsed Ultrasound
7. Progressive hip strengthening
8. Painfree isotonic knee flexion
9. Sciatic nerve flossing

10. Ice with sensory electrical stimulation

Criteria for progression to next phase

1. Normal walking stride without pain
2. Pain-free isometric contraction against submaximal (50%-70%) resistance during prone knee flexion (90°) manual strength test

Phase 2

Goals

1. Regain pain-free hamstring strength, progressing through full range
2. Develop neuromuscular control of trunk and pelvis with progressive increase in movement speed preparing for functional movements

Protection

Avoid end-range lengthening of hamstrings if painful

Ice

Post-exercise, 10-15 min

Therapeutic exercise (performed 5-7 d/wk)

1. Stationary bike
2. Treadmill at moderate to high intensity (progressive increasing intervals), pain-free speed and stride

3. Isokinetic eccentrics in non-lengthened state
4. Single-limb balance windmill touches without weight
5. Single leg stance with perturbation (eg ball toss, reaches)
6. Supine hamstring curls on swiss ball
7. STM/IASTM
8. Nordic hamstring drops
9. Shuttle jumps
10. Prone leg drops
11. Lateral and retro bandwalks
12. Sciatic nerve tensioning

Criteria for progression to next phase

1. Full strength (5/5) without pain during prone knee flexion (90°) manual strength test
2. Pain-free forward and backward jog, moderate intensity
3. Strength deficit less than 20% compared against uninjured limb
4. Pain free max eccentric in shortened state

Phase 3

Goals

1. Symptom-free (eg, pain and tightness) during all activities
2. Normal concentric and eccentric hamstring strength through full range of motion and speeds
3. Improve neuromuscular control of trunk and pelvis
4. Integrate postural control into sport-specific movements

Protection

Train within symptom free intensity

Ice

Postexercise, 10-15 min, as needed

Therapeutic exercise (performed 4-5 d/wk)

1. Treadmill moderate to high intensity as tolerated
2. Hamstring dynamic stretching
3. Isokinetic eccentric training at end ROM (ie hyperflexion)*
4. STM/IASTM
5. Plyometric jump training
6. 5-10 yard accelerations/decelerations
7. Single-limb balance windmill touches with weight on unstable surface
9. Sport-specific drills that incorporate postural control and progressive speed

Criteria for return to sport

1. Full strength without pain
2. Bilateral symmetry in knee flexion angle of peak isokinetic concentric knee flexion torque at 60°/s
2. Full range of motion without pain
3. Replication of sport specific movements at competition speed without symptoms