Strength and Neuromuscular Control

Regaining muscle strength, balance, and basic co-ordination are the goals of Phase 2. This phase usually commences with easy body weight type exercises and progresses into a gym-based regime with a mixture of resistance, balance, and co-ordination exercises.

It's important for clinicians and patients to 'listen to the knee' during this phase and only progress as quickly as the knee will allow. Increase in pain and/or swelling are the two main symptoms that indicate that the knee is not tolerating the workload.

Typical exercises and management activities during this phase include lunges, step-ups, squats, bridging, calf raises, hip abduction strengthening, core exercises, balance, gait re-education drills, and non-impact aerobic condition such as cycling, swimming, and walking. Some clinicians may start some introductory impact type activities such as walk-jogging or mini jumps during this phase, but the bulk of this type of training should be reserved for Phase 3.

The three most important goals of Phase 2 are:

- Regain most of your single leg balance
- Regain most of your muscle strength
- Single leg squat with good technique and alignment

Phase 2

Strength and neuromuscular control

Most important goals

Regain single leg balance

Regain muscle strength

Single leg squat with good control

Phase 2

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Phase 2: Outcome Measures and Goals

Outcome Measure	Test Description & Reference	Goal	√
Passive Knee Extension	Prone hang test (Sachs et al, 1989) Subjects lie prone on a treatment bed with the lower legs off the end allowing full passive knee extension. The heel height difference is measured (approx 1cm = 1°	Equal to the other side	○
Passive Knee Flexion	Supine with a long arm goniometer (Norkin & White, 1995). Bony landmarks: greater trochanter, the lateral femoral condyle, and the lateral mallelous.	125+	○
Swelling/ Effusion	Stroke Test (Sturgill et al, 2009) Zero: No wave produced on downstroke Trace: Small wave on medial side with downstroke 1+: Large bulge on medial side with downstroke 2+: Effusion spontaneously returns to medial side after upstroke 3+: So much fluid that it is not possible to move the effusion out of the medial aspect of the knee	Zero	○
Functional Alignment Test	Single leg squat test (Crossley et al, 2011) Subjects stand on one leg on a 20cm box with arms crossed. 5 x single leg squats are performed in a slow controlled manner (at a rate of 2 seconds per squat). The task is rated as "good", "fair" or "poor". For a subject to be rated "good"; • Maintain balance • Perform the movement smoothly • Squat must be to at least 60 degrees • No trunk movement (lateral deviation, rotation, lateral flexion, forward flexion) • No pelvic movement (shunt or lateral deviation, rotation, or tilt) • No hip adduction or internal rotation • No knee valgus • Centre of knee remains over centre of foot	Good	○

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Phase 2: Outcome Measures and Goals .. continued

Outcome Measure	Test Description & Reference	Goal	√
Single Leg Bridges	Single leg bridge test *variation (Freckleton et al, 2013) Subjects lie supine on the floor with one heel on a box or plinth at 60cm high. The knee of the test leg is slightly bent at 20° and opposite leg is bent to 90° hip and knee flexion with their arms crossed over chest. Subjects elevate the hips as high as possible and the assessor places a hand at this height. Repeat this action as many times as possible touching the assessors hand each time. The test concludes when the subject is unable to bridge to the original height (assessors hand).	> 85% compared with other side **Hurdle requirement** = >20 repetitions	○
Calf Raises	Single leg calf raises (Hebert et al, 2017) Subjects stand on one foot on the edge of the step and perform a calf raise through full range of motion. Calf raises are performed at 1 repetition every 2 seconds. The test concludes when subjects are unable to move through full range or slow below the cadence outlined above.	> 85% compared with other side **Hurdle requirement** = >20 repetitions	○
Side Bridge Endurance Test	Side bridge test (McGill et al, 1999) Subjects lie on an exercise mat on their side with legs extended. The top foot is placed in front on the lower foot, then subjects lift their hips off the mat to maintain a straight line over their full body length for as long as able. The test (time) ends when the hips return to the mat.	> 85% compared with other side **Hurdle requirement** 30 seconds	○
Single Leg Squat	Single Leg Rise Test (Culvenor et al., 2016 & Thorstensson et al., 2004) Subjects sit on a chair (or a plinth) with test leg bent to 90deg, and 10cm from edge of chair. With hands folded across the chest, the subject aims to stand up from the sitting position, and sit down as many times as possible.	> 85% compared with other side **Hurdle requirement** >10 repetitions each leg	○
Balance	Unipedal stance test (Springer et al, 2007) Subjects stand on one leg with other leg raised and arms crossed over the chest. The assessor uses a stopwatch to time how long stance is maintained on one leg with a) eyes open, and b) eyes closed. Time ends when; • Arms are used (uncrossed) • Use of the raised foot (touches down or other leg) • Movement of the stance foot • 45 secs has elapsed (maximum time) • Eyes opened on eyes closed trials	**A** (eyes open) 43 seconds **B** (eyes closed) 9 seconds (Normative data for 18-39 year olds)	○