

Academic Review: Knee Integrity Tests



Clients' present with lots of possible pathological conditions that may create pain/irritation at the knee and fall within the realm of a massage therapist. Some of these conditions include Osgood-Schlatters', Chondromalacia patellae, I.T. Band syndrome, Plica syndrome, as well as Bursitis conditions.

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Elimination of integrity damage to the knee

When a client presents with pain in the knee area, you must first eliminate any injury or damage to the inert structures of the knee which may alter your assessment and treatment protocol of your client. Information on damage may be eliminated through the patient history/consultation however, if you are unsure it is best to play on the safe side and test these structures of the knee. Should a client present in acute or severe pain the following tests must be performed prior to any general assessment process. Remember you are trying to recreate the pain the client came in complaining of. Also do the non-painful side first to give clients' an indication of what to expect. A useful memory tool when assessing these structures is to remember the three "C's"; collaterals, cruciates and cartilages (menisci).

Cruciate ligaments

Cruciate ligaments are commonly injured in forced hyperextension (ACL) or hyper flexion (PCL) as well as excessive rotation of the femur on a fixed tibia (as a firmly planted foot while changing direction rapidly).

Collateral ligaments

The Collateral ligaments are fully stressed when the knee is in full extension and are most often injured when the knee is in this position. The medial collateral will be strained or torn if the extended knee is violently abducted, whilst the lateral collateral ligament is damaged when the extended knee is forcibly adducted. In full extension, adduction and abduction at the knee are negligible but, if a collateral ligament has been torn, the extended knee can be moved away from the affected side.

Meniscus (cartilage)

Meniscus becomes damaged most often when the knee is flexed then a component of rotation is introduced, this draws the cartilage into the knee joint. The medial meniscus is the more commonly injured meniscus due to its reduced mobility on the tibial plateau when compared to the lateral meniscus. As a result it is more easily pinched between the tibia and femoral condyles. The medial meniscus is also often injured with the medial collateral ligament due to their fibrous interconnections so valgus strain on an extended knee is also a mechanism for medial meniscus damage. Meniscus damage is the most common cause of knee locking in flexion due to the meniscus being displaced and caught between femur and tibia or, a loose piece of the meniscus may do the same thing.

Screw home principle

Although the knee is condyloid in structure, it is functionally a hinge joint because lateral movement is prevented by the menisci and the cruciate ligaments. The principle movements of the knee are therefore flexion and extension however, rotation does become possible when the knee is flexed. When the knee is flexed from a fully extended position, internal rotation of the tibia has to take place to “unscrew or unlock” the knee. The following two tests test for the proper “screwing home” of the knee

Screw home test (see figure 1)

This test examines the screw home component of the knee to see that it is occurring properly; commonly comes up positive in cases of torn meniscus (bunching), effusion of the knee joint, and/or hypertonicity of the Popliteus muscle.

Client is in a supine position on the plinth with their hip and knee flexed to 90 degrees. Find the middle of the patella and the middle of the tibial tuberosity and place a dot on them. Grasp clients’ distal tibia and support their knee. Passively extend the knee keeping the heel on the plinth. The dot on the tibial tuberosity should be positioned more lateral than in the starting position. If this does not occur then the screw home principal is not occurring normally.

Figure 1. Screw home test



Figure 2. Bounce home test



The Bounce home test can be done in conjunction with the Screw home test keeping in mind their different findings.

Bounce home test (see figure 2)

This test evaluates the screw home component and the locking of the knee. A positive test occurs when the knee “falls short”, giving a boggy or spongy resistance to full extension. This test commonly comes up positive in cases of torn meniscus (bunching) or effusion of the knee joint.

Client is in a supine position on the plinth. The starting position is the same as the screw home test. Cup clients’ heel. Passively extend the knee keeping the heel on the plinth. There should be hard, solid end feel.

Sliding drawer test

This technique is a useful and effective way for testing the stability at the knee joint and determining any weakness or strain of the cruciate ligaments. Recreation of clients’ pain indicates strain to the cruciate ligament being tested. Excessive movement with no pain indicates a complete tear or previous injury with over stretching of the cruciate being tested.

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Sliding drawer test (See figure 3)

Client is supine on the plinth in a hook lying position (hip and knee flexed to 90 degrees). Make sure clients heels are equal and that they sit on their feet for stability. Grasp the clients' knee with both hands, thumbs on anterior borders of the joint. Apply anterior movement of the tibia on the femur (testing ACL) and posterior movement of the tibia on the femur (testing PCL). Compare anterior movement of one knee with anterior of the other knee and same for posterior movement.

This test can be modified to test the posterior aspects of the joint capsule as well. This is done by rotating the tibia medially then applying an anterior movement (lateral posterior capsule), then laterally and applying anterior movement of the tibia (medial posterior capsule).

Figure 3. Sliding drawer test



Figure of Eight movement (See figure 4)

This technique is a useful and effective way for testing the stability at the knee joint and determining any weakness or strain of the collateral ligaments. This movement is also useful for mobilization of the joint, overcoming stiffness, and breaking down adhesions. Recreation of clients' pain indicates strain to the collateral ligament being tested. Excessive movement with no pain indicates a complete tear or previous injury with over stretching of the collateral being tested.

Client lies supine on the plinth, with their leg over the edge of the plinth. Stand facing the client and firmly grip their leg, just superior to the ankle joint, between your thighs. Place both hands firmly around the clients' knee, with your fingers at the back of the knee in the popliteal space, and with your thumbs placed at the front of the medial and lateral borders of the tibia head. Now, holding the knee firmly, take it through a figure '8' movement a few times, imagining that the figure '8' is being written on its side (i.e. oo) instead of upright. Apply with traction (using your thighs to traction tibia) then with out traction. Compare lateral movement of one knee with lateral of the other knee and same for medial movement.

Figure 4. Figure of Eight



This test can be modified to test the meniscus by compressing the tibia into the femur (with your thighs) and applying the same figure of eight movement.

Valgus/varus test (See figure 5)

Figure 5. Valgus/Varus test



This technique is a useful and effective way for testing the stability at the knee joint and determining any weakness or strain of the collateral ligaments. Recreation of clients' pain indicates strain to the collateral ligament being tested. Excessive movement with no pain indicates a complete tear or previous injury with over stretching of the collateral being tested.

Client is supine on the plinth with a bolster under the knees to "unlock" them. Stand on side to be tested. Place thumb and fingers over medial and lateral joint lines to feel for gapping and stabilizing the knee. Grasp distal aspect of the tibia and apply an abduction/adduction movement. Compare abduction movement of one tibia with abduction of the other tibia and same for adduction movement.

Figure 6. Apley's distraction test

**Apley's distraction test** (see figure 6)

This technique is a useful and effective way for testing the stability at the knee joint and determining any weakness or strain of the collateral ligaments. Recreation of clients' pain indicates strain to the collateral ligament being tested. Excessive movement with no pain indicates a complete tear or previous injury with over stretching of the collateral being tested.

Client is prone on the plinth with their knee flexed to 90 degrees. Gently kneel on the back of the thigh to help stabilize it. Grasp distal aspect of the tibia with both hands and apply a distraction force. While maintaining the distraction, rotate the tibia medially then laterally. Compare medial rotation movement of one tibia with medial rotation of the other tibia and same for lateral rotation movement.

Figure 7. Apley's compression test

**Apley's compression test** (see figure 7)

This technique is a useful and effective way to aid in determining if a torn meniscus is present. Recreation of clients' pain indicates possible meniscus damage. Palpable or audible clicking or grating may also indicate meniscus problems.

Client is prone on the plinth with their knee flexed to 90 degrees. Grasp distal aspect of tibia and calcaneus on the sole of the foot. Place body weight on calcaneus towards plinth in order to compress meniscus between tibia and femur. Maintaining compression, rotate the tibia medial and lateral. Monitor for any pain and/or clicking or popping.

Figure 8. McMurray test

**McMurray test** (see figure 8)

This technique is a useful and effective way to aid in determining if a torn meniscus is present. This test is more effective in testing the posterior aspect of the medial meniscus because of the crossing of the cruciate ligaments which limit the amount of medial rotation of the tibia, therefore, limiting the effectiveness of testing the lateral meniscus. Recreation of clients' pain indicates possible meniscus damage. Palpable or audible clicking or grating may also indicate meniscus problems.

Client is in supine position on the plinth. Flex coxa to 90 degrees and knee to midrange. With one hand on calcaneus, place the other so that the thumb and fingers lay across the knee joint. Place a medial pressure on the knee to gap the medial joint space. Rotate the tibia laterally to bring the posterior aspect of the medial meniscus into the joint space. Maintain this position and extend the knee. Monitor for any pain and/or clicking or popping.

Patellofemoral articulation

The final inert tissue that should be evaluated at the knee is the patellofemoral articulating surfaces. Improper tracking of the patella may create uneven wearing on the posterior surface of the cartilage and may create conditions such as patella femoral syndrome (chondromalacia patella).

Patellar grind test (see figure 9)

This test is performed to test the articulating surface of the patella as well as the trochlear groove of the femur. During the testing procedures for the patella-femoral articulation the therapist monitors not only for recreation of the clients' pain but also important to monitor the clients' face for signs of apprehension as this is also a positive sign. Remember as in all testing protocol, test the uninjured side first in order to give the client an idea of what to expect.

Client is supine on the plinth. Place a firm contact with your hands over the patella. Compress the patella towards the plinth. While maintaining the compression, slowly rotate the patella inferior then superior.

Figure 9. Patellar grind test



Zohlers sign (Patellar tracking test) (see figure 10)

This test determines improper tracking of the patella due to weakness in the vastus medialis muscle, tightness in the vastus lateralis muscle or possibly rotated or displaced tibias. This test is performed to test the articulating surface of the patella as well as the trochlear groove of the femur. During the testing procedures for the patella-femoral articulation the therapist monitors not only for recreation of the clients' pain but also important to monitor the clients' face for signs of apprehension as this is also a positive sign.

Client is supine on the plinth. Place contact on the superior aspect of the patella. Pull the patella inferior in the trochlear groove. Have client contract their quads as you offer resistance to the patella as it moves superior.

Figure 10. Zohlers sign



Nobles' compression test (see figure 11)

Another informative testing procedure for the knee is Nobles' compression test which tests for Iliotibial band syndrome (runners' knee). This condition is usually secondary to other dysfunction of the knee or hip but none the less is important to test for when clients' have a complaint of lateral knee pain. A positive test indicates Iliotibial band syndrome and usually has a muscular involvement of the gluteus maximus and/or the T.F.L influencing the tension on the IT band.

Client is in a supine position on the plinth. Grasp distal aspect of clients' tibia and flex the knee to 90 degrees followed by hip flexion, also to 90 degrees. Apply a flat pressure across the IT band approximately 1/2 to 1 inch superior to the lateral femoral epicondyle. Maintain the pressure and slowly extend the knee. A positive test would indicate recreation of the clients' pain at approximately 30 degrees of flexion.□

Figure 11. Nobles' compression test

