ONLINE ARTICLES FOR SAFETY IN SPORT CAMPAIGN

Knees by Kimberley Shone

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A bit about the author, Kim:

Kim is an Advanced Soft Tissue Therapist working in sport and private clinic as a Performance Sports Therapist. Kim worked at the Asian Indoor and Martial Art Games in Ashgabat, Turkmenistan in 2017 as part of the Multi-Disciplinary Team (MDT), and has been Head Sports Therapist to Paviors RFC whom have been 'Best In Nottingham' since 2015. From taping, assessments, soft tissue therapy and performance advice, Kim has helped international athletes, rugby players and general gym members prevent and rehabilitate all kinds of injuries, both big and small. Kim also has a large professional network and recognises the importance of taking an MDT approach.

To find out more about Kim, her website is:

www.movewellnottingham.com

The difference between an athlete and non athlete?

The difference between an athlete and non athlete is the recognition of recovery. An athlete has a responsibility to improve and develop to enable them be the best they can be, which requires recovery support from Soft Tissue Therapy to Cryotherapy.

Knees 101

- What: Synovial hinge joint
- Connects: Femur to tibia and fibia
- Movements:

Sagittal plane- extension and flexion

Transverse plane- some rotation

- Most common injuries: ACL and MCL strains and tears

Knee prehabilitation and rehabilitation.

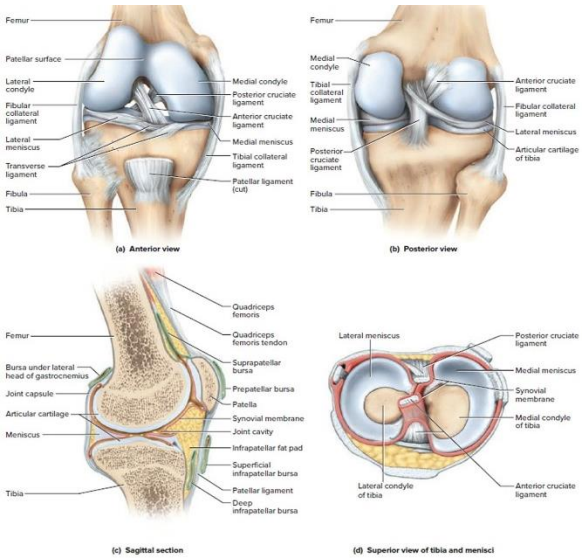
The RFU in their Injury Surveillance Report[1] shows that knees are an increasing area for rehabilitation for rugby players. It could be argued that this is due to game intensity which has required the integration of better HIA protocols and the involvement of TMO. However, there needs to be better protocols with a performance focus to help prevent serious injuries involving joints such as knees, shoulders and ankles. Dallalana *et al.,* (2007)[2] found that "each club studied had a mean of 10 knee injuries per season resulting in a total of 353 days absent." The knee joint is extremely complicated, with performance depending on the balance through the ankle, and support provided by the hip and pelvis.

The knee is one of the most complicated joints in the body due to its complex design. It consists of:

- **Collateral Ligaments** which help to prevent excessive transverse movement, the LCL (Lateral Collateral Ligament) stabilising the outer knee and MCL (Medial Collateral Ligament) stabilising the inner knee.
- **Cruciate Ligaments** within the knee which help to prevent excessive forward and backward movement. The PCL (Posterior Cruciate Ligament) primary controls excessive backward motion and secondary stabilises excessive external rotation. The ACL (Anterior Cruciate Ligament) primary helps to prevent excessive forward motion and secondary rotation movements.
- **Menisci** (plural) to which there are two within the knee joint. They are crescent shaped pads of fibrocartilage…

…attached to the flat surface of the superior tibia (tibial plateau) which reduce friction between tibia and femur, help weight distribution and act as shock absorbers. There is one on the inner knee, and the other on the outer knee, the inner meniscus being the larger of the two.

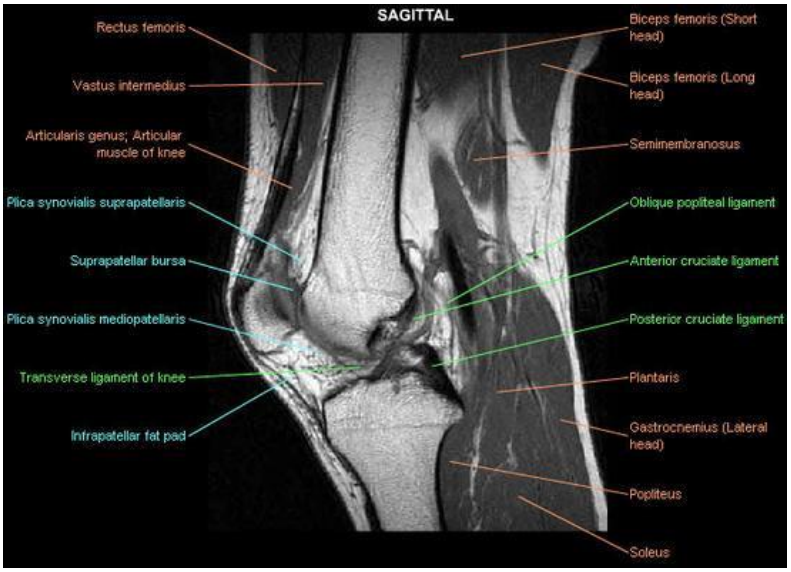
- **Patella** (aka kneecap) is a sesamoid bone meaning it grows within the quadriceps tendon and is situated on the anterior surface of the knee between the femoral condyles.
- Other components include the **Transverse Ligament** which connects the medial and lateral menisci, **Oblique and Arcuate Popliteal Ligaments** which help stabilise the posterolateral aspect of the knee.



[1] https://www.englandrugby.com/mm/Document/General/General/01/32/91/95/InjurySurveillanceReport2016-17_English.pdf

[2] RJ Dallana, JHM Brooks, SPT Kemp & AW Williams. The epidemiology of knee injuries in English professional rugby union. American Journal of Sports Medicine, May 2007; 35: 818 – 830

Knee Prehabilitation and Rehabilitation Continued…



Source: Orthobullets. Image showing an MRI scan of a knee with anatomy labels.

Injuries explained:

- **Grading:** Injuries are graded I, II or III, depending on severity. With grade I being minimal and III being complete severance.

- **ACL:** Rarely do strains and tears of this ligament occur in isolation and are more common as Combination Ligament Injuries which can include meniscus tears, articular cartilage injuries or MCL injuries. They tend to occur in sports which involve pivoting and sudden deceleration as this places increased pressure on anterior translation, and most common when the knee rotates whilst the foot remains planted. For prevention, hamstring strength and aligment with foot balance exercises should be considered. For diagnosis, ACL injuries incur bone marrow lesions (BML) which is visable through MRI which can also help explain the mechanism of the injury.

- **PCL:** As the LCL and Popliteus Complex have a primary objective of supporting posterolateral movement, very rarely is the PCL injured in isolation. They are commonly associated with meniscal and chondral injury, with varus and valgus increasing further risk to which valgus and varus laxity can incur isolated PCL injury. Such injury tends to occur with hyperextension, or a direct blow to the anterior tibia whilst the knee is in flexion such as in contact sport. An MRI can help diagnose PCL injury with predictive accuracy.

- **For understanding purposes:** ACL injury can incur pain when walking downstairs whilst PCL injury can incur pain when walking upstairs. These are not the only symptoms but can help diagnosis.

- **MCL:** Usually caused by valgus stress as this increases pressure on the inner knee, particularly when in a flexed position. Whilst it can be common to incur such injury…

…in non-contact sport, contact sport does have a greater risk such as tackling in rugby for example which increases medial translation pressures. In grade I injuries there is minimal swelling, more common in grade II injuries, with grade III injuries involving associated capsular tearing, fluid escapes, and swelling, noting distal injuries take longer to recover. Noting how pes anserine provides further stability to which injury to the MCL can incur pain symptoms into the adductors.

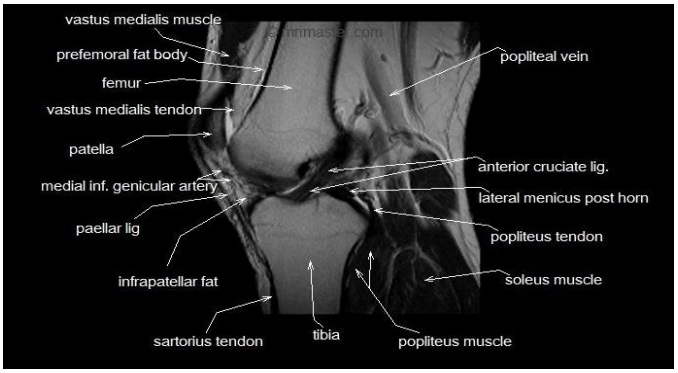
- **LCL:** Much less common than MCL injuries, usually caused by varus stress during high-energy activity. Very rarely injured in isolation and must not be confused with bicep femoris tendon avulsion or ACL tears. Usually associated with PCL rupture, to which delayed reconstruction is relatively diifficult meaning immediate surgical intervention should be conducted.

- **Meniscus tear:** Occuring through forceful twisting of the knee and usually associated with ligament and tendon injuries and capsular tearing. The “unhappy triad” involves MCL, ACL and menisci. The medial meniscus is injured more commonly than the lateral mensicus.

- **Patella dislocation:** Usually occuring during deceleration, knee twist, or impact, and usually associated with muscle imbalance or structural deformity. Rarely requires MRI for diagnosis, but can be used if a severe dislocation to assess if any further damage.

- **Patellofemoral Pain:** Tension in the quadricep muscles can cause tension through the patella tendon to which if left unresolved through soft tissue therapy and S&C, it can cause inflammation of the articular cartilage underneath the patella. Can be caused by repetitive patella dislocations. RICE, soft tissue therapy and S&C are used to resolve.

- **Chondromalacia Patellae:** Micro-trauma to the articular cartilage of the patella usually caused by overuse, dysfunctional biomechanics, misalignment of the patella or previous patella fracture. Generally resolved by RICE, soft tissue therapy and S&C, rare cases of surgical intervention.



Source: MRI Master. Image showing an MRI scan of a knee with anatomy labels.

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Injury	Severity	Immediate Care	Rehabilitation	Recovery Time
ACL, PCL, MCL and LCL. Noting that combined knee injuries will take longer to recover.	Grade I. No bruising. No swelling.	RICE. Noting stability taping can be used for compression.	Taping techniques (kinesio and stability) can initially help, with exercises such as walking, exercise bike and balance work such as wobble board training. Soft tissue therapy can be used in surrounding areas.	Depending on immediate care and rehab quality, between 1-6 weeks.
	Grade II. No to minimal bruising. Minimal swelling.	RICE. MRI can be used to help diagnosis including assessment of surrounding elements.	Knee brace for 2-6 weeks, with exercises such as walking, exercise bike and balance work such as wobble board training. Soft tissue therapy can be used in surrounding areas, moving more proximal as rehab continues, making sure to provide joint support.	Depending on injury severity, immediate care and rehab quality, between 6 weeks -6 months.
	Grade III. Bruising and swelling. Unable to bear any weight.	RICE. MRI required to measure extent of injury. Immediate use of knee brace.	Surgery will be required, with preoperative rehab enabling chances of better recovery. Post operative rehab involving exercise training, compression, soft tissue therapy, cryotherapy and kinesio taping can be helpful but only for a short term basis.	Depending on immediate care, preoperative rehab, and lead time for surgery, around 12months.
Meniscus tear. Noting the outer 1/3 of the meniscus has a blood supply enabling tears within this region to heal.	Grade I. Able to weight bare, minimal swelling, full ROM (pain only at end range), and pain only in inner range of flexion during the McMurray's Test.	RICE. MRI can be required to assess extent of injury, particularly with an athlete in contact sport and/or sport requiring sudden changes in direction.	RICE, manual therapy including soft tissue therapy, gait re-education, athlete education. Compression can include taping techniques (both kinesio and stability). S&C subjective to the athlete, injury and sport, but initially it will be light with a focus on biomechanica; correction, and sympathetic to ensure no further aggrevation and potentially worsen the injury. S&C will increase in intensity as the condition of the knee improves.	Depending on immediate care, and rehabilitation quality including manual therapy intervention, 3-5 weeks.
	Grade II. Some swelling, reduced weight bearing ability, and pain during the McMurray's Test.	RICE. MRI required to assess extent of injury. Depending on weight bearing ability and pain symptoms, a knee brace can be used.	Surgical or non-surgical management depeding on MRI, pain symptoms and sport.	Depending on immediate care, and rehabilitation quality including manual therapy intervention, 3-5 weeks. Recovery post arthroscopic partial menisectomy can be 4 weeks if tear is small and isolated.
	Grade III. Swelling, pain upon weight bearing, and a positive McMurray's Test.	RICE. MRI required to assess extent of injury. Surgical intervention will usually be required and must be done urgently.	Surgical intervention can be an arthroscopic meniscal suture, athroscopic partial menisectomy or removal of the damaged 'flap' of the meniscus. Extent and type of surgery depending on the extent of injury. Postoperative rehabilitation is initially light with a focus on regaining ROM, increasing as condition of the knee improves.	Recovery post arthroscopic partial menisectomy can be 4 weeks if tear is small and isolated. Can be 3-5 weeks but Longitudinal and 'Bucket Handle' tears are more serious and will require longer for rehab.

Sources: Brukner, Peter. Brukner & Khan's clinical sports medicine. North Ryde: McGraw-Hill, 2012.Walker, Brad. The anatomy of sports injuries. North Atlantic Books, 2007.

Table 2 provides an overview of the three most common injuries since 2012-13 in the two highest severity categories and the associated average severity of those injuries, classed within that grouping (e.g. the average severity of concussion is the average severity of concussions within the specific severity categories, and not all concussions). This data shows that the injuries within these higher severity groupings have largely remained similar since 2012. In 2016-17, Hamstring injuries and Concussion appear in the > 84 day category for the first time.

Table 2: The types and associated severities of 29-84 and > 84 day match injuries (2012-17)

	29-84 DAYS			>84 DAYS	
	INJURY TYPE	AVERAGE SEVERITY		INJURY TYPE	SEVERITY
2012/13	ANKLE SYNDESMOSIS	46	2012/13	ACL	213
	HAMSTRING	47		MCL	117
	MCL	50		ANKLE SYNDESMOSIS	105
2013/14	ANKLE SYNDESMOSIS	40	2013/14	ACL	244
	HAMSTRING	40		COMBINED KNEE LIGAMENTS	191
	MCL	59		PEC TEAR	122
2014/15	HAMSTRING	49	2014/15	ACL	229
	MCL	53		ANKLE SYNDESMOSIS	119
	ANKLE SYNDESMOSIS	57		ANKLE DISLOCATION	157
2015/16	HAMSTRING	49	2015/16	PCL	137
	CONCUSSION	39		ACJ	142
	MCL	54		ACL	294
2016/17	MCL	59	2016/17	HAMSTRING	120
	CONCUSSION	43		ACL	258
	ANKLE SYNDESMOSIS	59		CONCUSSION	148

Table 2, 23b and 24b: Source: https://www.englandrugby.com/mm/Document/General/General/01/32/91/95/InjurySurveillanceReport2016-17_English.pdf

The highest burden match injuries

Figure 23b:

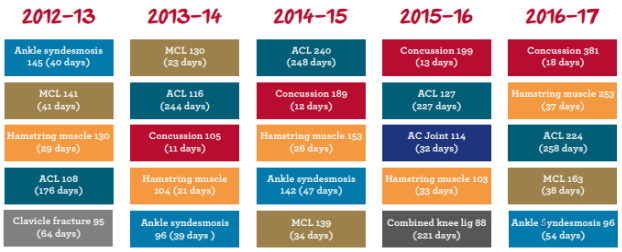

Figure 23b: Ranking of the top 5 highest burden match injuries for each season 2012-16 with the associated days absence/1000hours (Figure in brackets represents average severity for that injury type).

Highest burden training injuries

Figure 24b:

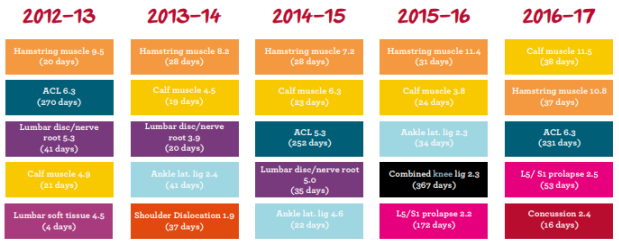

Figure 24b: Ranking of the top 5 highest burden training injuries each season 2012-16 with associated days absence/1000hours. (Figure in brackets represents average severity for that injury type).

Why is performance so important?

Awareness and understanding of performance is vital for any athlete as it reduces risk of injury, and more efficient rehabilitation in the situation of injury. This is particularly so with any contact sport as these sports are more likely to incur an impact injury. Such awareness and understanding will include objective elements such as posture, and also subjective elements which are sport specific.

Performance encompasses a plethora of components from Sports Psychology and mental health support, to manual therapies including Physiotherapy, Soft Tissue Therapy, Chiropractic and Osteopathy.

Whilst athletes rely on advice and guidance of Support Team including Head Coach, S&C Coaches, Physiotherapists and Soft Tissue Therapists for example, it is important that the athlete implements the advice and guidance as much as possible, not just when attending such appointments. Whilst the athlete is responsible for their own body, they require the best Support Team to ensure they get the best advice and guidance.

If you want more information as to how Kim can help you and your team, please feel free to get in contact: https://www.movewellnottingham.com/about

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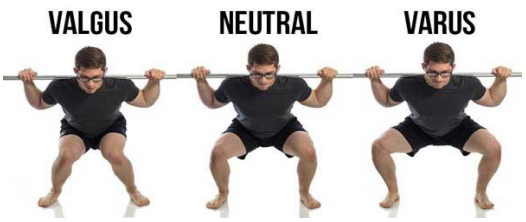
Performance:



This image shows the difference between knee valgus and varus compared to neutral positioning. It is clear that both valgus and varus positionings can be detrimental to knee function, and also subsequent joints in the ankle and hip.

º **Knee Valgus and Varus:** Knee Valgus referring to a weaker inner knee where the femur lacks support from the hip and inner ankle (including a dysfunctional big toe aka hallux) and allows medial rotation of the femur, linking with foot supination. Knee Varus referring to a laterally rotated femur and linked with foot pronation, caused by tension in the hip and dysfunctional biomechanics of the ankle and foot.

Therefore, strength is required in a neutral position to help functional stability of the joints, whilst balance exercises such as those involving a Wobble Board for example can help improve proprioception. By training with such awareness, it can reduce risk of ACL, PCL, LCL and MCL injury.

º **Balance through the ankle:** Optimum alignment for balance requires efficient use of the big toe. Nakai et al., (2019)[3] found that bunions can be directly connected to fallen arches aka supination, and can lead to forefoot pain, meaning a simple hallux valgus can create instability of the knee through the tibia. Therefore, optimum alignment involves absorbing 119%-300% of your body weight through the big toe whilst moving, and functional tensegrity relationships between big toe – arch – medial malleolous (inner ankle). By training with such awareness, it can reduce risk of ACL, PCL, LCL and MCL injury.

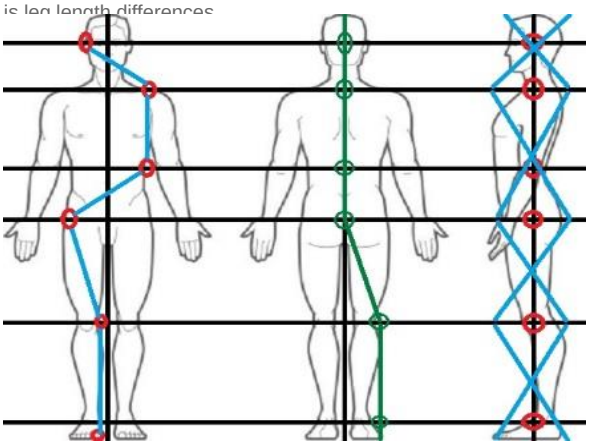
For more information on the topic of the big toe, check out: https://www.movewellnottingham.com/single-post/2019/03/14/Big-Toes-for-Big-Performance

º **Flexibility vs Tension:** An individuals genetic composition can help determine whether an individual is hypermobile or…naturally tight. Hypermobility requires increased stability training, where as naturally tight individuals require mobility training. Thus, training needs to be subjective to help the collagen – elastin relationship within the soft tissue matrix.

Regarding knees, hyperextension can incur a greater risk of injury meaning a focus on strengthening the hamstrings is vital. However, strengthening the hamstrings is useless if not optimally aligned, as lateral rotation of the leg for example can result in a weaker bicep femoris and overloading through the semitendinosus and semimembranosus. Soft tissue therapy is an excellent complimentary therapy to Strength and Conditioning as it can help improve alignment and promote more efficient and healthier biomechanics.

"Hypermobility requires increased stability training, where as naturally tight individuals require mobility training."

º **Posture and Biomechanics:** For optimum performance with reduced risk of injury, and for optimum recovery for rehabilitation, an athlete needs to consider improving their posture which will help influence more efficient and functional biomechanics. Consideration for the knee involves a functional relationship between glute and abdominal muscles, use of the big toe with positioning of the foot, and positioning of the head as a forward tilt for example can increase groin tension which increases risk of injury. Most common postural and biomechanical factor that Kim finds in both sport and clinic work which tends to go misdiagnosed is leg length differences.



Copyright of Move Well Nottingham. This image shows optimum alignment. Such alignment is vital for posture and biomechanics which directly impact performance.