Hindmarsh and Fitzroy Physiotherapy Clinics

ANTERIOR CRUCIATE LIGAMENTS

Prevention of ACL injuries

Sports Physiotherapy Guide on understanding and preventing ACL injuries in our young sports women

A LITTLE ABOUT ACL INJURIES

Netball is the number 1 team based sport in Australia for females, with over 1.2 million participants nationally. Due to the nature of the game – involving sudden stopping, changing of direction and repeated landing, the risk of a lower limb injury is significantly increased. In fact 85% of all netball injuries occur at the knee or ankle. They are also common in basketball and no doubt women's football as it increases in numbers

Traditionally ankle injuries have been the biggest lower limb problem, but recently knee injuries have actually become a more common injury, with the vast majority being ACL injuries. The majority of cases require a total knee reconstruction that requires at least 9-months of comprehensive rehabilitation.

Most people don’t realise that Females are four to six times more likely to sustain ACL injuries than men and young adolescent girls are up to 8 times more likely to suffer an ACL injury.

This doesn't help in a game like netball where players constantly stop suddenly and play on hard surfaces. Injuries can occur with landing after contesting the ball in many sports where small perturbations or knocks occur mid air.

However 70% of ACL tears involve little or no contact with another player !
The severity of these injuries can range from minor to very serious, with some injuries requiring surgery to fully heal. These injuries may be caused from poor training practices, improper equipment, flawed techniques, or may just be an accident. Injuries can also occur when a person is not properly conditioned to play the actual sport, such as not warming up or stretching inappropriately beforehand.

We know not everyone has the capacity or time to see one of our physios for help with injury prevention. But at Hindmarsh and Fitzroy Physiotherapy we are passionate about education. Knowledge is power and hopefully we can help you to understand some of the aspects of these injuries and in doing so help prevent so many of our young sports women having these career altering injuries.

We look forward to providing you with some education and advice you and your coaches can undertake to help prevent these injuries.

**This e-book is not intended as a substitute for medical advice or treatment and should not be interpreted as such. If you are experiencing any of the symptoms mentioned in the e-book please contact our physiotherapists for a comprehensive assessment and treatment plan. Always seek advice from a qualified medical professional and use of this information is at your own risk.*

WHAT IS AN ACL?

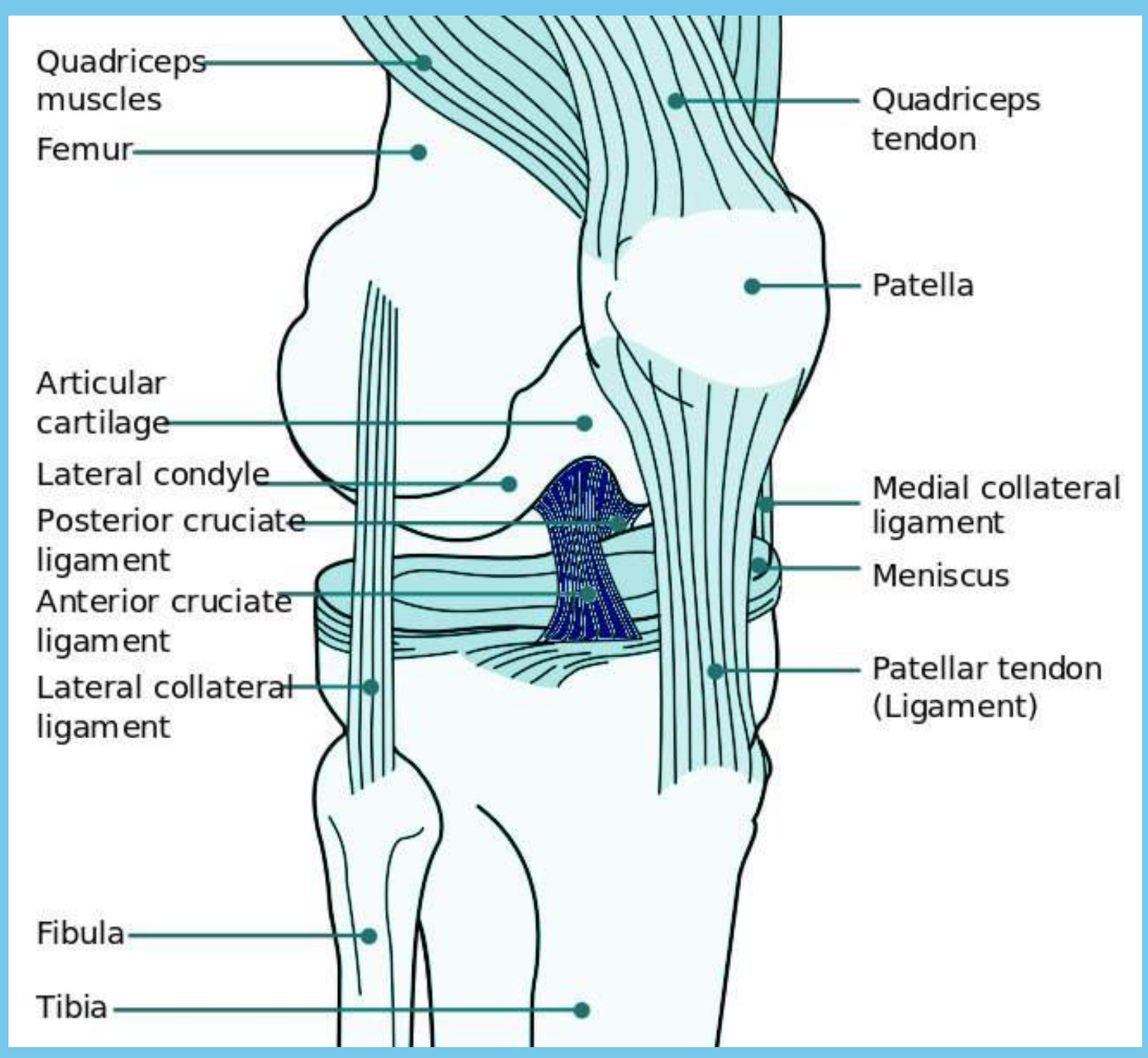
Basic anatomy

There are four main ligaments that stabilize the knee. The anterior cruciate ligament is responsible for stabilizing rotational movements at the knee that occur during cutting and pivoting activities.

The ACL is also a secondary restraint to the knees hyperextension.(bending backwards)

The ACL stabilizes the knee joint in two ways. First, the ligament acts as a passive restraint to excessive movement through its connection to the tibia and femur. It prevents the tibia (shin bone) from sliding forward on the femur (thigh bone).

Secondly , the ACL has mechanically sensitive nerve receptors, called proprioceptors, which sense the position of a joint. When a joint starts to exceed its normal range or speed of movement, these proprioceptors will send a signal to the brain and spinal cord, which in turn stimulates the appropriate muscles to stabilize and protect the joint.



Mechanism of tear

As mentioned earlier an ACL injury usually occurs without contact from another player. The most common form of non-contact injury is a deceleration injury. A player is planting their foot to land or change directions, and the ACL cannot withstand the force placed on it, so it tears. This causes the knee to buckle or give out. The ACL also can be torn if the knee is forcefully hyperextended while landing from a jump.

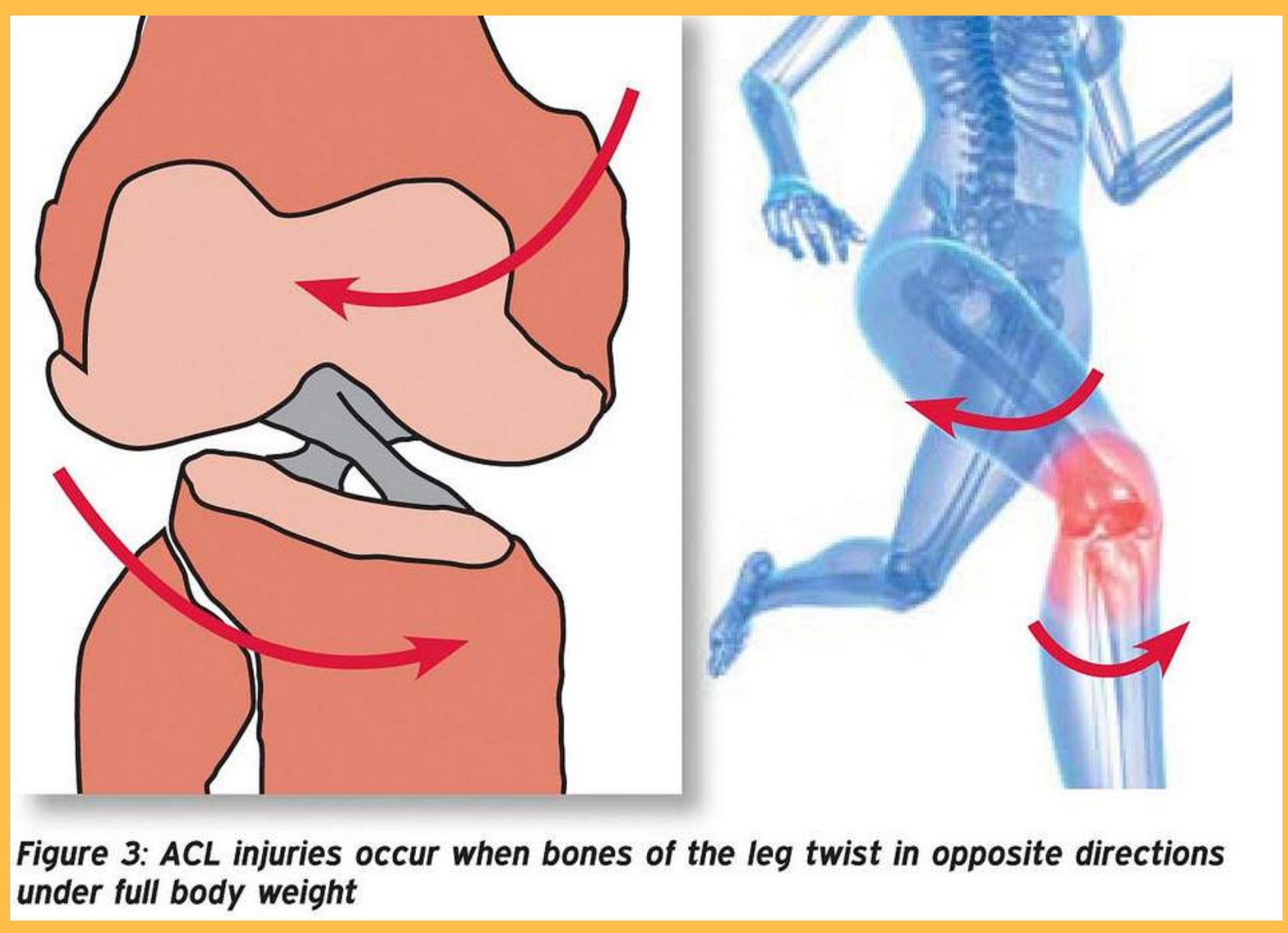


Figure 3: ACL injuries occur when bones of the leg twist in opposite directions under full body weight

www.sportcx.net.jpg/flickr

Treatment principles

When treating an ACL injury, the key is controlling the instability of the knee. Repeated instability not only affects athletic performance, but more importantly increases the risk of further injury to the cartilage and other ligaments of the knee. Cutting and pivoting activities are the most stressful for the ACL and therefore are the activities most likely to reproduce the instability in an athlete with a torn ACL.

The choices for treatment should be individualized and should take into account the age, activity level and the desire to return to sports which require significant amounts of cutting and pivoting or other high-speed movements.

One form of conservative treatment is to modify the athlete's sports participation. This involves discontinuing sports involving cutting and pivoting, such as soccer, netball and basketball. These sports could be replaced by sports that do not involve cutting and pivoting, such as swimming or running. Another form of conservative treatment is rehabilitation. Rehabilitation for an ACL injury focuses on improving an athlete's proprioception and reactive muscular stabilization. For sports such as basketball, soccer , netball and football, rehabilitation alone will not always be enough to prevent instability. If instability persists, the athlete must usually undergo surgical reconstruction of the ligament to return to these sports.

What are the Symptoms of an ACL Injury?

Step. Twist. POP- For anyone who has ever injured their anterior cruciate ligament (ACL), they probably know this dreaded 'pop' all too well. They may have felt or heard a "pop" in their knee, and the knee usually gives out from under them. ACL tears cause significant knee swelling and pain.This 'pop' usually means a torn ACL plus or minus other damage.

WHY ARE GIRLS AND WOMEN MORE SUSCEPTIBLE?

Posture & landing

Women may be more prone to non-contact ACL injuries because they run and cut sharply in a more erect posture than men, and bend their knees less when landing from a jump.
Women tend to use a Flat-footed landing rather than the balls of the feet.

But it is also likely due to a number of anatomical and hormonal differences between men and women.

Anatomical reasons

- Narrower intercondylar / femoral notch
- Wider pelvis applying more pressure to the medial knee.
- Greater Quadriceps/Hamstring Strength Ratio: hamstrings unable to balance the quads strength.
- Slower reflex stabilising time of the muscles.
- Females have a smaller anterior cruciate ligament with less collagen fibres.

Hormonal factors

More lax ligaments
Changes in oestrogen levels affecting ACL strength. Possible increase risk of tears during ovulation.

Age

Age is also a risk factor with girls aged 15-18 at highest risk of developing an ACL injury.

netballimages-rae slater/flickr.com

PROBABLE INJURY SCENARIO

When video sequences of actual ACL injuries are examined, it appears that there are four common motor performance components that occur, especially in women. As the at risk female athlete lands, her knee buckles inward. The injured knee is relatively straight. Most if not all of her weight is on a single lower extremity. Finally, her trunk tends to be tilted laterally. In summary, her centre of mass is outside of her base of foot support.

These same mechanisms also occur in men but the exaggeration of the positioning of the lower extremities and trunk is much greater in women. Directly related to the four common components of the typical mechanism of injury are four neuromuscular imbalances termed ligament dominance, quadriceps dominance, leg dominance, and trunk dominance.

Existing evidence suggests that these four neuromuscular imbalances may be associated with the underlying ACL injury mechanisms. Therefore it is suggested that these imbalances should be screened for and indentified in individual athletes.

More information can be obtained in UNDERSTANDING AND PREVENTING ACL INJURIES: CURRENT BIOMECHANICAL AND EPIDEMIOLOGIC CONSIDERATIONS - UPDATE 2010

Please email us here if you would like the reference

CHILDREN'S ACL INJURIES

The number of ACL injuries in children is rising.
These are active children and they are often the best child athletes and the most daring ones. As this is a relatively recent occurrence the literature doesn’t yet know what happens to these children who rupture their ACL. Do they grow up like their friends, doing sports or prioritizing education and going on with their life? Or does the injury and treatment change their lives?

It appears there are as many meniscal tears in children who have surgical reconstruction as there are in children who choose non operative treatment of the injury. Worryingly there is a 25% re injury rate among children who have reconstructions. Growth disturbances can occur after surgical treatment, but these are rare.

The irony is that we seem to have good technical capability to deal with these challenges, but the injury still seems to have a major impact of the child. Very few, if any of the children become high level athletes in pivoting sports.

Taking Childrens sporting injuries seriously- here

WHY IS THIS SO ...

Speed of sport

A discussed factor is that Children's sport is getting faster and more professional possibly being responsible for the rise in number of young people needing knee reconstructions.
Medicare data in Australia shows the number of children undergoing ACL reconstructions has more than tripled in the last 15 years. This does not take into account those who did not undergo surgery or were treated in the private system.

Early specialisation

Possible reasons suggested for the increase include : the rates of participation in sport at a very young age is increasing and also the early specialisation in one particular sport. Three components that define early sports specialization include year-round training (>8 months per year), choosing a single main sport, and quitting all other sports to focus on 1 sport.
Increased degree of specialization is positively correlated with increased serious overuse injury risk as well.

Playing surfaces and shoes

Dry friction? - this occurs when two surfaces in contact move relative to one another and footwear traction depends on the interaction between the shoe and the sports surface. ACL injury rate in women is significantly higher on rubber-coated artificial floors than on wood floors;
Injury risk actually INCREASES when you wear new shoes due to the increased rigidity of the gripping sole.

MODIFIABLE RISK FACTORS SUMMARISED FOR NETBALL

The majority of ACL injuries occur upon landing, whether it is on single leg or double leg landing. Usually after contesting a ball – often where small perturbations or knocks occur mid air, or as a result of a player twisting mid air to turn down court and not landing with appropriate technique. A valgus knee (the knee joint being twisted outwards from the centre of the body) places an increased strain the anatomically smaller and weaker ACL and is a major contributor for injury.

Due to the neuromuscular control differences, where most females have stronger quadriceps than hamstring muscles with delayed activation and recruitment of these muscles, more strain is placed on the ligaments to counteract these forces. Compared to their male counterparts, when landing females tend to land more upright posture which places more valgus strain on their knees, whereas males tend to land with a wider base of support and in more of a squat position.

Other specific areas in which ACL injuries can occur is with sudden change of directions and deceleration – most commonly following a strong drive.

How is an ACL tear diagnosed

On clinical knee examination, your physiotherapist or sports doctor will look for signs of ACL ligament instability. These special ACL tests place stress on the anterior cruciate ligament and can detect an ACL tear or rupture. An MRI may also be used to determine if you have an ACL tear. It will also look for signs of any associated injuries in the knee, such as bone bruising or meniscus damage, that regularly occur in combination with an ACL tear. Plain X-rays are of little clinical value in diagnosing an ACL tear

HOW CAN PHYSIO HELP

Technique

A qualified and knowledgeable physiotherapist or coach can assess your technique in completing different tasks, and determine any areas which need to be improved to reduce risk of injury.

Screening the tuck jump can be used to evaluate the knee and thigh motion, asymmetry of legs, foot position, consistency and placement on landing, contact noise and technique timing and fatigue.

Jumping and Landing

Good Technique involves landing with feet facing forward and shoulder width apart. Knees and hips should be slightly bent upon impact to absorb shock and knees and ankles should remain in line without and valgus or knock-kneed position.

The most common area of poor technique when jumping and landing is the positioning and alignment of hips, knees and ankles.

With weakness at the hips or knees players find themselves in a knock-kneed position where feet and now wider than their knee position.

This places much greater stress through the knees and is a major risk factor for ACL injuries when landing

Change of direction

Appropriate technique with changing direction involves bending through the hips and knees to absorb shock, and using small steps.

The outside leg should be used to absorb the landing and decelerate, and the inside leg to then push and accelerate in the new direction. Most commonly injuries can occur here when the same leg is used for both deceleration and acceleration.

Deceleration through a drive or sprint should involve multiple short steps, with hips and knees bent and trunk upright.

Often netballers who have not been shown this correct technique will use one long stride to attempt deceleration, putting a much larger force through the knee.

HOW CAN PHYSIO HELP

Range of movement

The knee is placed in between your ankle/foot and hip, it's really important to have full mobility at these joints to allow your knee to do its job properly. If you have really tight hips and are trying to twist and turn repetitively when sidestepping, that movement is going to come from your knee. And what movement places your ACL at greatest risk of injury? twisting.

Our physios are able to compare your range to optimal and implement some effective treatment techniques to improve your mobility. Once you're moving the way your body was designed, it's time for you to develop the strength and control to keep your newly found range of motion.

Strength

While at times a simple explanation of correct technique can allow a player to alter how they complete these tasks, there are others that may be unable to perform these correctly due to muscle weakness or imbalances.
Weakness in muscles which are supportive of the knee – such as **gluteals, core and hamstrings** can all lead to an inability to complete these tasks with appropriate technique, leading then to an increased risk of ACL injury.

A physiotherapist with netball knowledge will be crucial in developing a strengthening program – as well as warm up /activation program for pre game to develop these muscles and increase protection around the knee.

The most common area of poor technique when jumping and landing is the positioning and alignment of hips, knees and ankles.

PREVENTION PROGRAMS AND WARM UP

A number of sporting organisations at the higher level have set out programs. The programs are warm up routines and they not only decrease injury risk, they aid in skill development and performance. Examples include: FIFA 11+; footy first (AFL); the PEP (Prevent injury and Enhance Performance Program) program; and more recently netball Australia's KNEE program.

Netball Australia, working in association with the Australian Institute of Sport, has developed their KNEE program. The KNEE program is an on court warm up program designed to enhance movement efficiency and prevent injury before training and competition.

The KNEE program targets three specific groups of players – junior, recreational and elite level – with different exercises tailored to match the predicted capabilities of each group. The KNEE Program has been designed to educate athletes, coaches and support staff. It has been modelled from other injury prevention programs that have been proven to reduce injuries by 40-70 percent and adapted to accommodate the unique demands of netball

Our Physios are able to educate individuals and teams on implementation of the program. Take you through the key principles, how to use it and any questions you may need answered. It is a wonderful program but can be daunting for a player or club to implement.

We can guide you through the process, explaining the warm up, strength, balance, landing and agility components. We are more than happy to speak with your coaches.

PRINCIPLES OF THE KNEE PROGRAM

The KNEE program

The KNEE Program is an on court warm up program designed to enhance movement efficiency and prevent injury before training and matches.The keys principles focus on good technique of take off, landing, deceleration and change of direction and it includes components of strength, dynamic balance and agility.

It targets safe take off and landing technique with specific attention to the overhead arm position required of netballers. It also conditions the athlete for efficient deceleration and change of direction equipping players with the skills needed to cope with the specific multi-directional demands of netball.

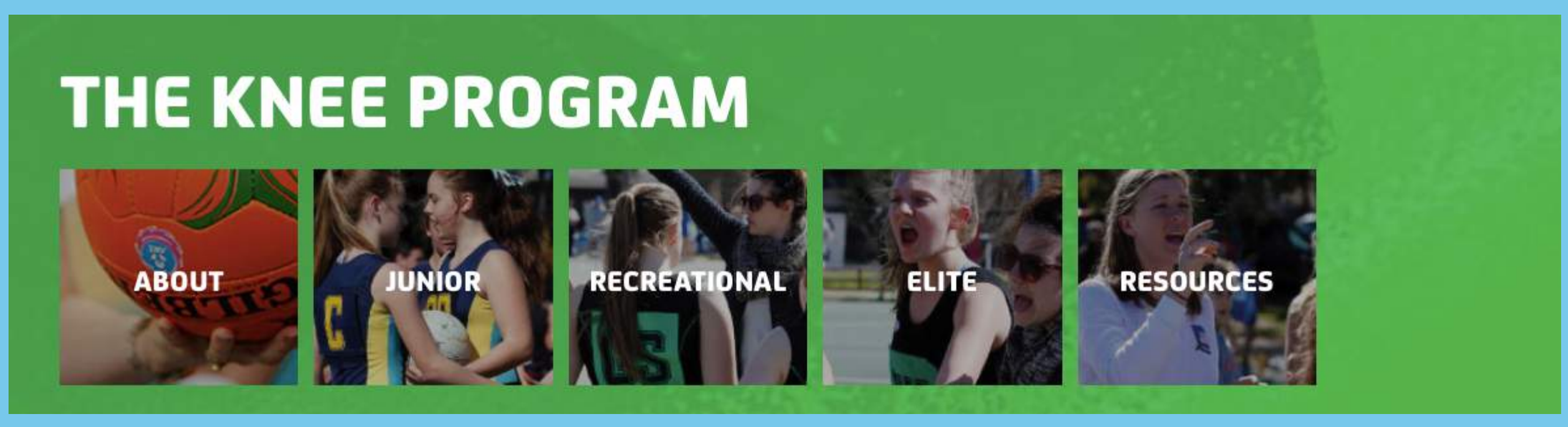
The success of the program is dependent on buy in from both coach and athlete. As a coach this resource will help you to identify and amend risky movement patterns. As a player it provides a visual reminder of ideal movement. It allows athletes who are participating in multiple teams to be consistently performing the one program.

The KNEE Program targets three specific groups of players – junior, recreational and elite level athletes with different exercises tailored to match the predicted capabilities of each group and has been designed to educate athletes, coaches and support staff with different downloadable content for each group.

The KNEE Program needs to be completed at least twice a week for maximum effectiveness and must be continued for the effects to be maintained. Not only must the program be continued, but also it must be done with correct technique to ensure risky movements are eliminated rather than reinforced

To learn more about the The Knee Program speak with our physios who who can advise and guide you and your club through the program..

Contact us - here



ANOTHER PREVENTION PROGRAM

The PEP program

The PEP program (Prevent injury and Enhance Performance Program) has been shown to decrease both first time ACL injuries and further ACL injuries after reconstruction. This program is a highly specific session that replaces the traditional warm up. It consists of a warm-up, stretching, strengthening, plyometrics, and sport specific agility training.

Athletes can reduce their risk of ACL injuries by performing training drills that require balance, power and agility. Adding plyometric exercises, such as jumping, and balance drills helps improve neuromuscular conditioning and muscular reactions which decrease the risk of ACL injury. It is important to use proper technique during jumping moves (jump straight up and down jumps without excessive side-to-side movement), and aim for soft landings. Optimally the program should be performed at least 2-3 times per week during the season.

Basic components

1.Warm-up (50 metres each):
A. Jog line to line of soccer field (cone to cone)
B. Shuttle run (side to side)
C. Backward running

2. Stretching (30 s × 2 reps each):
ACalf stretch
B. Quadricep stretch
C. Figure 4 hamstring stretch
D. Inner thigh stretch
E. Hip flexor stretch

3. Strengthening:
A.Walking lunges (20 metres × 2 sets)
B. Russian hamstring (3 sets × 10 reps)
C. Single toe-raises (30 reps on each side)

4. Plyometrics (20 reps each):
A. Lateral hops over 2 to 6 inch cone
B Forward/backward hops over 2 to 6 inch cone
C. Single leg hops over 2 to 6 inch cone
D. Vertical jumps with headers
E. Scissors jump

5. Agilities:
A. Shuttle run with forward/backward running (40 yards)
B. Diagonal runs (40 yards)
C. Bounding run (45–50 yards)

An additional contributing factor to ligament injuries is possibly overtraining. Overtraining injuries are musculoskeletal injuries that occur due to more activity or exercise than your body is used to, and may happen to anyone who increases intensity or changes type of activity. Overtraining can cause fatigue and without the protective effect of strong muscles, ligaments are placed under more stress.

Preventing injuries is a complex area and it can involve factors such as maximising the available range of motion in joints, maximising strength in appropriate muscle groups and, at the elite level, it involves complex monitoring of training loads to prevent over training.

As the ACL provides roughly 90% of overall stability to the knee, it's easy to see why an effective injury prevention program is so important

How to avoid overtraining injuries blog

Final tips to prevent ACL injuries

- Prepare by building up your training and fitness prior to playing.
- Participate in core strength and flexibility exercise programs such as pilates and yoga
- Work on your coordination and train your body in specific sporting movements
- Ensure you speak to your doctor or physiotherapist about any slight aches and pains
- Consider taping to support your knees and ankles from abnormal movement.
- Train your sport specific muscles .
- Learn programs and drills that work on specific exercises to develop strength, agility and flexibility around the knees and ankles. ▪
- Use dynamic warm-ups before matches & training rather than static stretching
- Warm down and stretch or use a foam roller after training or playing .

At Hindmarsh and Fitzroy Physiotherapy Clinics we are friendly experienced, patient focused professionals with a passion for helping a wide variety of people. We know that there are many excellent physiotherapy practices to choose, but finding one you can count on and build a relationship with, knowing they have pride and expertise in their approach, high quality treatment regimes, empathy and support is not easy. This is us. Please call or email us for an appointment and we look forward to helping you.

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Contact us here

**This e-book is not intended as a substitute for medical advice or treatment and should not be interpreted as such. If you are experiencing any of the symptoms mentioned in the e-book please contact our physiotherapists for a comprehensive assessment and treatment plan. Always seek advice from a qualified medical professional and use of this information is at your own risk.*

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