UPWELL
HEALTH COLLECTIVE

THE ACL ATLAS

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THE INJURY ITSELF

BACKGROUND OF ACL INJURIES:

It is likely common that you or someone you know has had an ACL injury. If you are a football or a sport fan you would be well aware of this injury. Funnily enough, Australia has the highest rates of ACL injuries the world, Yikes!

If you are one of the nearly 200,000 ACL reconstructions that occurs every 5 years you will likely understand this injury and if you are an individual who has only recently just injured your ACL, you have come to the right place.

Below is an all inclusive guide to what an ACL injury is, how it can be managed effectively based on current research and what can be done to not only get you back out onto the field, but reduce your risk of possible complications in the future.

WHAT IS AN ACL INJURY?

The ACL is one of 4 major ligaments in the knee joint that are responsible for passive stability of the joint. This ACL itself is responsible for controlling the forward movement of the shin bone and other rotational movements. This is especially important when you are required for running, jumping, landing and changing directions.[1]

An ACL rupture occurs when there is overstretch and consequent failure of the anterior cruciate ligament to provide stability within the knee. With ACL ruptures, there may be an audible pop, a feeling of the knee collapsing and swelling that accumulates quite rapidly in the first 30 - 60 minutes.

Sometimes, only a partial tear of the ACL can occur, in that the ligament is stretched but doesn't completely rupture. There is still some debate around the difference of diagnosis regarding partial tears and how they can be classified, however the subsequent treatment will usually depend on the degree of laxity and instability of the knee. This is usually a discussion that is had with a specialist or surgeon after injury.

NON-CONTACT VS CONTACT ACL INJURIES

ACL injuries are most common in multi-directional sports and may be a contact, or non-contact mechanism. A contact ACL injury is the result of direct contact with another player or an object to the lower extremity that causes the ACL to tear under the intense amount of load or force. A non-contact ACL tear is a little harder to define but does not involve direct contact and is usually a situation involving, landing, running, sprinting or cutting. It has been reported that approximately 70% of ACL injuries are non contact.[ref 2]

SO YOU THINK YOU MAY HAVE DONE YOUR ACL? WHAT HAPPENS NEXT?

DON'T PANIC:

Easier said than done, but the first thing to comprehend is - this is not the end of the world, although sometimes it can feel like that in the moment, it is positive thinking that will help you throughout your rehabilitation and/or surgery. Unfortunately, there is a lot of media pressure and societal expectations that leads to ACL injuries having such a negative connotation. Australia also has the highest rates of reconstruction numbers in the world, meaning that surgery is often on the forefront of our minds when we have injured our knee.

In the sporting world often language around "potential career ending injury" or "fearing the worst" is used a lot when it comes to time away from the game. This sets us up to fear even the act of injuring our knees and what that will do our future.

However, with plentiful option in regards to management, and amazing rehabilitation the worst is often not what we think it will be.

DIAGNOSIS

Following a suspected ACL injury, a full assessment is required to determine the extent of the injury. If you have a physiotherapist then it is best to see them so they can complete a particular batch of orthopaedic tests and, if an injury to you ACL is suspected, you will most likely be referred for imaging (MRI) to confirm. If you don't have current physiotherapist, one of our physiotherapists here at Upwell can see you for a full assessment and develop a plan going forward for you.

On many occasions, injuries to the ACL do not happen in isolation. You may also find that you have an injury to an adjacent knee structure such as a meniscus or another ligament of your knee such as your MCL, during the injury. This will be factored into your surgical and recovery plan by your physiotherapist and/or surgeon.

MANAGEMENT OF YOUR ACL INJURY

SURGERY VS CONSERVATIVE MANAGEMENT - IS IT REALLY A CASE OF ONE "VERSUS" ANOTHER?

Once you have completed your diagnostic management and an ACL rupture has been found, now is the time to decide what can be done to manage this injury. In Australia, generally we have well set up pathways that contribute to having scans, surgery and rehab within a very small time frame making this the "general pathway" for most ACL injuries. However recent research is suggesting that surgery may not be the only option for everyone, including those that want to return to sport.

In a recent review of the literature it has been found that only 1 of 412 randomized control trials actually compared surgery to conservative rehabilitation for ACL management.[ref 3] To have an option of forgoing surgery is extremely revolutionary thinking, and one that needs to be considered under a case by case situation including yourself, family, physiotherapists and doctors.

If you want more information on conservative management please refer to the end of this guide for an interview with renowned surgeon Justin Wong.

SO HOW DO I DECIDE WHAT IS BEST FOR ME?

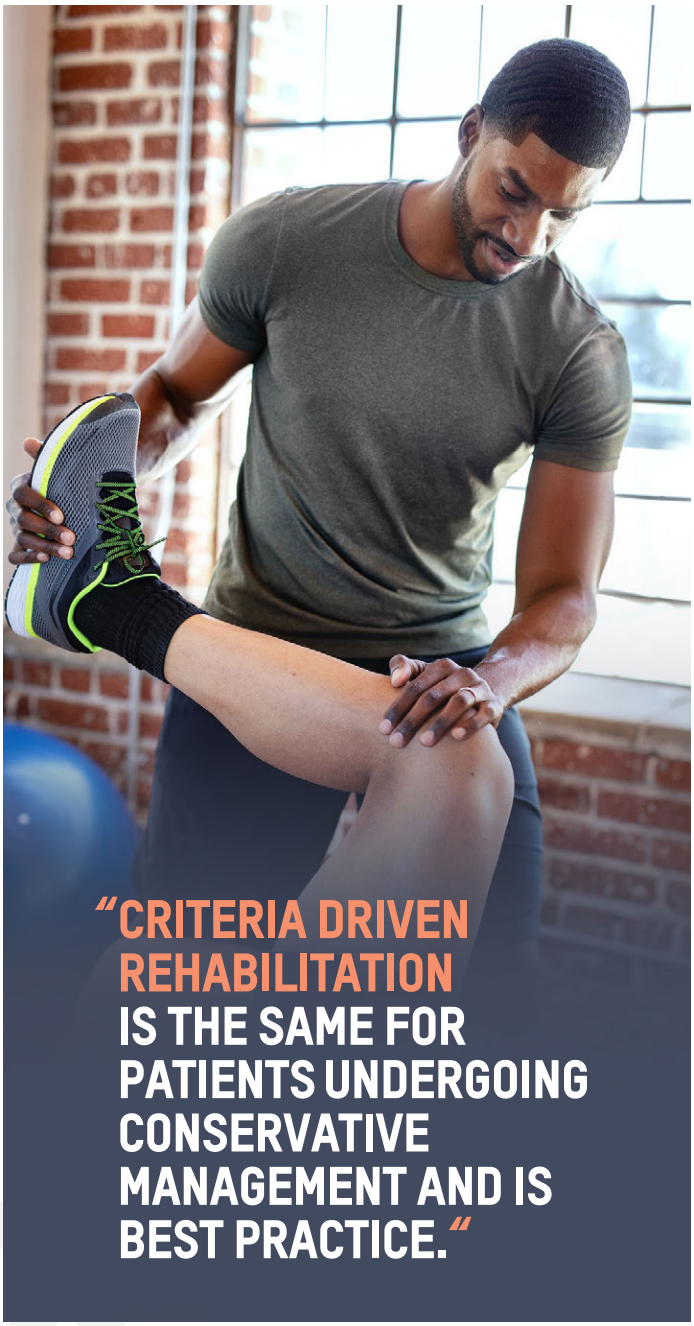
The important thing to know is that you do have an option and you do have a choice. This shared decision-making process cannot be hurried, as it requires careful explanations from your surgeon or physiotherapist and comparisons of potential outcomes from the treatment option, and discussing potential risks/ harms weighed up against proposed benefits.

Possible questions to ask your surgeon and treating team would be:

- What are the risks if I do have surgery and what are the risks if I don't?
- What will the function of my knee look like in 10-20 years?
- Does surgery mean that I will have a higher risk of osteoarthritis when I'm older? Will not having surgery increase or decrease that risk ?
- Can I go back to playing sport?
- Do I need to rehab my knee if I do or do not have surgery?

(Spoiler alert - exercise is an/ if not the most important factor regardless of surgical treatment!)

Make sure that you have weighed up the pro's and con's, have spoken to your surgeon and treating team and have found a solution that works for yourself and your lifestyle.



"CRITERIA DRIVEN REHABILITATION IS THE SAME FOR PATIENTS UNDERGOING CONSERVATIVE MANAGEMENT AND IS BEST PRACTICE."

NON-OPERATIVE MANAGEMENT:

If you are going to go down the nonoperative management route and still want to return to physical activity then there it is a necessity to complete your rehabilitation and strength and conditioning program.

According to leading researchers in this field, regardless of surgery versus non-operative management before returning to physical activity we still need a strong and stable knee. This means no symptoms, good mobility and adequate strength. It also means that you will need great proprioception, plyometric strength, adequate training volume and sports-specific skills, and patients also need to be equipped to handle the psychological load of returning to physical activity.

Criteria driven rehabilitation is the same for patients undergoing conservative management and is best practice.

Best available research evidence recommends that all patients should commence with conservative management including physiotherapy and exercise as the first line of treatment with education aiming to decrease fear around movements and encouragement to start rehabilitation as soon as possible. We often expect return to sport times to be earlier if there has been so surgery as you won't need the recovery that is needed after a reconstruction.

OPERATIVE MANAGEMENT AND TECHNIQUE:

If it has been determined that you will need surgery to repair your ACL, a discussion with your orthopaedic surgeon around a donor graft from an area in your body will be recommended to be used to reconstruct the ligament. Grafts can be taken from surrounding areas of the knee. The most common in Australia being a section of your outer hamstring tendon. Other options include reconstruction with the patellar tendon, and most recently, reconstruction with the quadriceps tendon. Each donor site has its own pros and cons and this is usually something that your surgeon will discuss with you.

Then surgery will take place!

REHABILITATION OF AN ACL INJURY

WHO IS INVOLVED IN THE REHABILITATION PROCESS?

There are a few key personnel that should be present at different stages during the rehabilitation process. The most important person in the rehab process is you! You should be at the centre of your own care and always having an understanding of where you are at and what you might be working on at a particular point in time.

You will also have a surgeon, who would have completed your surgery and given you post-operative guidelines as well as a physiotherapist who should be involved early on in the management of your rehabilitation. If you have goals of returning to sport or engaging in physical activity (which everybody should!) then a suitably qualified Exercise Physiologist who has upskilled in Strength and Conditioning should also be involved in your care, taking you from rehab to a high performance return to sport or every day movement.

All of these personnel should be great at communicating and working together. They might overlap in their time with you and you may see multiple practitioners at once, hence the importance of good communication.

PHASES OF RECOVERY

Whilst the phases of ACL recovery are generally fairly similar for most ACL repairs, it is important to note that every rehab journey is different, and every ACL is different. Some people may progress faster than others, some may have setbacks or some may experience symptoms that others may not. Your rehab journey is unique and should always be treated as such.

PRE-PHASE 1

PREHABILITATION PRIOR TO SURGERY AND GOING IN STRONG

Sometimes a period of time exists in between rupturing your ACL and having surgery. This can extremely valuable because it allows you to "get a head start" on the strengthening and proprioception exercises that you will need to complete post surgery. A graduated, progressive strengthening program for your quadriceps muscles, hamstrings and gluteals and calves can help to provide better function for your knee after you have had surgery. This is not a step to be skipped, as research shows that success rate is higher for post opertaive manaageent when good pre-habiliation has taken place.[4]

PHASE 1

THE BEGINNING

Range of motion | Pain and Swelling | Walking normally

If you have had ACL surgery, the first step will be restoring range of motion and basic strength to the muscles that have been affected by the surgery, whilst also maintaining respect to the healing graft. For the first 2 weeks, restoring range in extension (straightening your knee) is extremely important as this allows you to restore strength in your quadriceps muscle. Making sure your pain is under control and you are resting as much as possible during the first week is also very important.

Your physiotherapist at this point is the person that you will most likely see the most, and give you exercises to complete on your own that will help to build strength and restore full range of motion.

Manual therapy and massage are paramount in this stage of rehab and will help to restore adequate range in your knee and surrounding tissues.

PHASE 1

ALTER - G

Normalizing your walking without crutches is also a goal of this stage, a machine called an Alter-G can be very beneficial for restoring proper gait. Normal pain- free gait can be achieved by focusing on proper swing techniques with a reduction in body weight on the alterg until full weight-bearing. Squats, calf raises and other exercises may also be completed in the Alter-G. The Alter-G Anti-Gravity Treadmill can enable you to progressively load the lower extremities and maintain non-compensatory gait patterns during rehabilitation.

This is also a good time to see an Exercise Physiologist or Strength and Conditioning Coach if you play sport or want to remain physically active - this time can be crucial for keeping you fit and healthy while you are going through your rehab, especially your early rehab. Off legs conditioning exercise such as arm bike, boxing and other strength exercises for other limbs can be done in this time when you are feeling mobile and your pain is under control. This is also good for your mindset as it can remind you of how strong and fit you can be, outside of rehabbing your knee.

PHASE 2

ALL ABOUT THE STRENGTH

Strength | Proprioception | Balance

During phase 2, it is important to regain strength and control of your knee. Your physiotherapist will guide you through body weight exercises, gym exercises and balance and control exercises. Sometimes an increase in swelling and pain can be felt during this phase but are not to be ignored, and usually a sign that the load of your rehab is a little bit too high. Exercises to strengthen the quads, hamstrings, gluteals, adductors and calves are the most important in this phase, and this can be done in a variety of ways. Remember if you have had a hamstring graft, then hamstring strength is equally as important to target in the early stages of rehab. Improving or maintaining normal movement patterns are also super important in this stage and your physiotherapist will guide you on proper technique with your exercises to make sure that you completing them properly. Try not to rush through your exercises, as proper technique is equally as important than strength in this phase.

PHASE 2

BLOOD FLOW RESTRICTION TRAINING

In this stage of rehabilitation, your therapist may also recommend using a form of treatment known as Blood Flow Restriction training (BFR). Doing exercises with BFR involves an external pressure cuff applied to the muscle which is inflated to a pressure that restricts outflow of blood while allowing inflow to continue. This creates an environment for the muscle to gain a similar effect in growth as that of high resistance training, though at a lower and safer intensity. Heavy loads typically required for muscle hypertrophy and strength adaptations are contraindicated during the early stage of rehab due to possible graft strain and concomitant cartilage, meniscal, and bone pathologies associated with ACL reconstruction. Passive BFR can attenuate early muscle atrophy and strength loss and therefore accelerate your rehabilitation. Whilst BFR training can seem dangerous, it is very safe and is being used by athletes around the world to progress their rehab.[5]

A TIME TO WORK ON WEAKNESSES

This is a good opportunity to start thinking about what your weakness might be in other aspects of your health? Have you always struggled with trunk and core stability? Or previous history of shoulder problems? This time when you are rehabbing your knee can be a great opportunity to work on those things as well so when you return to physical activity or sport you are one step ahead. Flag these with your physio or exercise physiologist. It can make you feel like you are more in control of your health and can contribute positively to an overall sense of wellbeing.

PHASE 2.5

MORE STRENGTH, ALWAYS!

In this stage it is ideal to start getting an opinion of a qualified Exercise Physiologist or Strength and Conditioning Coach to assist in your strength programming. This is a vital step that has previously been overlooked in ACL rehabilitation programs. It is the section of your rehab that has less research around best practice, even though it is one of the most important and largest phases.

This may be a time where your treating practitioners will overlap as it may be necessary to see a physiotherapist for some manual therapy while you improving your strength, but the bulk of your time now should be spent in the gym getting strong. Whether you are returning to sport or not it is imperative that everyone who has an ACL rupture returns to equal strength on opposite sides and has a benchmark to prevent further injuries from occurring.

This is also a phase where running can commence. Usually this is a happy day in the rehab process but can also feel very daunting. There is often specific things that your exercise physiologist or physiotherapist will want you to be able to do before you commence running. Including around 70% strength from your unaffected side to your affected side in your hamstrings and quads, good single leg control and no pain and full range of motion.

PHASE 3

HOPS, HOPS AND MORE HOPS.

It is in this phase where we see a patient return to running, change of direction or agility and some landing exercises. Your therapist may have already started some landing exercises with you, and these will be progressed in this stage. Don't be surprised if they also give you a bit more rest though, a lot of these exercises are fatiguing so your load and pacing strategies will need to be managed well. Again, patience is a must in this phase, and it will be tough for your brain and nervous system to start jumping again. Give yourself some time to get it right and understanding how far you have come up to this point, which is an amazing feat.

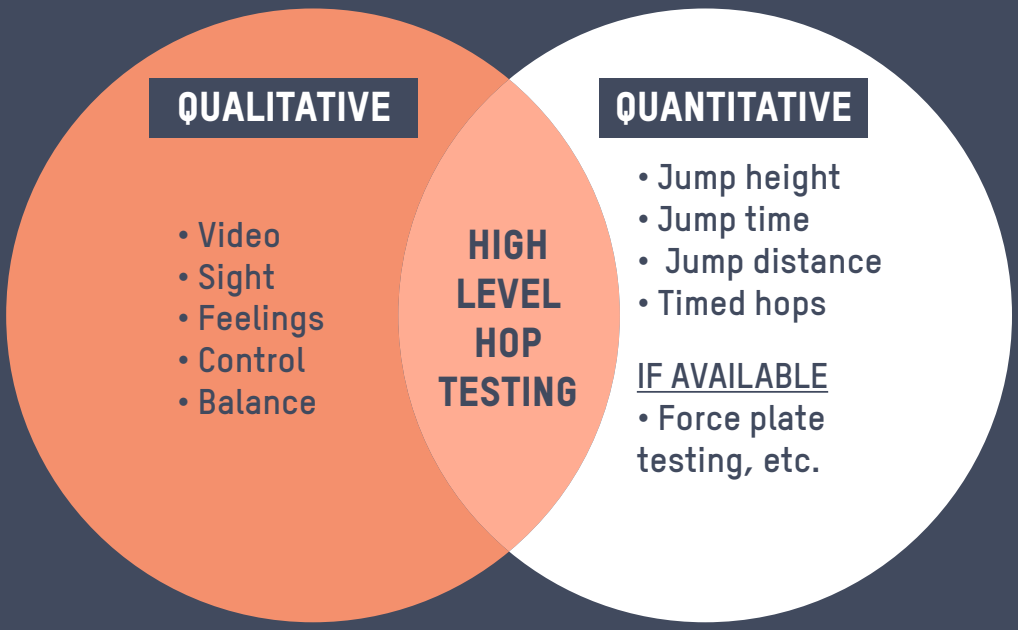
"IT WILL BE TOUGH FOR YOUR BRAIN AND NERVOUS SYSTEM TO START JUMPING AGAIN."

You will also start completing some hop testing to ascertain your baseline measures and know where to target your rehabilitation best.

It is recommended that an athlete has to score >90% of the unaffected side on these tests to have a reduced risk of reinjury or injury. Quality of take-off and landing mechanics should also be assessed, on top of quantitative scores. Even with meeting the criteria for the hop tests, there is still a chance of injury, however according to current research, having a large amount of control, stability and strength with landing exercises has been shown to reduce risk of re-injury.

However, while hop testing is beneficial it is not the only outcome measure that is important in this phase of pre-return to sport. They are easy to administer tests but we also know that measuring only hop distance, even using the healthy leg as a reference, is insufficient to fully assess knee function after ACL reconstruction. We need to look at quality of landings, knee control as well as ankle and hip function during these tests.

TESTING VENN DIAGRAM



Strength is arguably the most important factor in returning to being physically active, or returning to playing sport. Restoring equal strength in both sides of your body in the hamstrings, quads, calves and glutes is the most important factor in your rehabilitation. It is generally accepted that strength on the affected side should be restored to 90% of the other side during strength testing.

PHASE 3 CHANGE OF DIRECTION

In this phase, if you are wanting to return to playing sport then some change of direction drills are also very important to both returning your ability to move quickly and also to prevent further injuries. Although often agility and change of direction are used interchangeably, they are quite different and need to be practiced and trained differently.

Change of direction (COD) focuses purely on physical ability to move directions in pre-planned environments whereas agility involves reactive abilities in unpredictable environments.

As we will outline below, a large part of ACL rehabilitation will involve making sure that the neural pathways from our brain are firing and our brain can process information quickly. In sport and in life agility needs components of : visual processing, timing, reaction time, perception and anticipation and these also need to be trained throughout your rehab and properly assessed and progressed as you improve. It is not enough to return to sport without training these components, it is a large part of your rehabiliation!

PHASE 3

THE BRAIN AFTER YOUR ACL INJURY - HARDWARE VS SOFTWARE

The act of being 'released' to play sport after injury is as complex as ever, with most rehab research focussing on early stage rehab and time based progressions, it is easy for a gap to appear between your perceived versus actual sport readiness.

Looking beyond the mechanical structures of the knee is important and extremely warranted for you and your health practitioners. New research has shown that ACL injury induces a mild neurological insult to the central nervous system, that is there are changes in mechanoreceptors, pain and a development of motor compensations. This means the brain and its neural pathways need to be a factor considered in ACLR.[6]

This can involve adding in exercises that challenge your spatial-cognitive-motor training pathways and improving coordination. It is likely that people who have injured their ACL are more likely to rely on their visual systems rather than moving more intuitively when compared with those that have not sustained an injury. This can get complex when playing sport and when there are a lot more visual stimuli to respond to.

Incorporating cognitive tasks in your rehab is as important as building strength or maintain mobility. It will prevent further and new injuries by improving visual speed processing to prepare for complex sensory and visual cues. The ability to change your body and movements plays a role in the feedforward mechanisms that plan motor activity. Does this mean that we can anticipate and prepare for high risk situations in sport? And does this mean that we can then influence the risk of musculoskeletal injury ? A small body of evidence supports this, however a lot more research needs to be done in the later stages of ACL rehab so we can then have larger pools of data to draw from.

PHASE 4

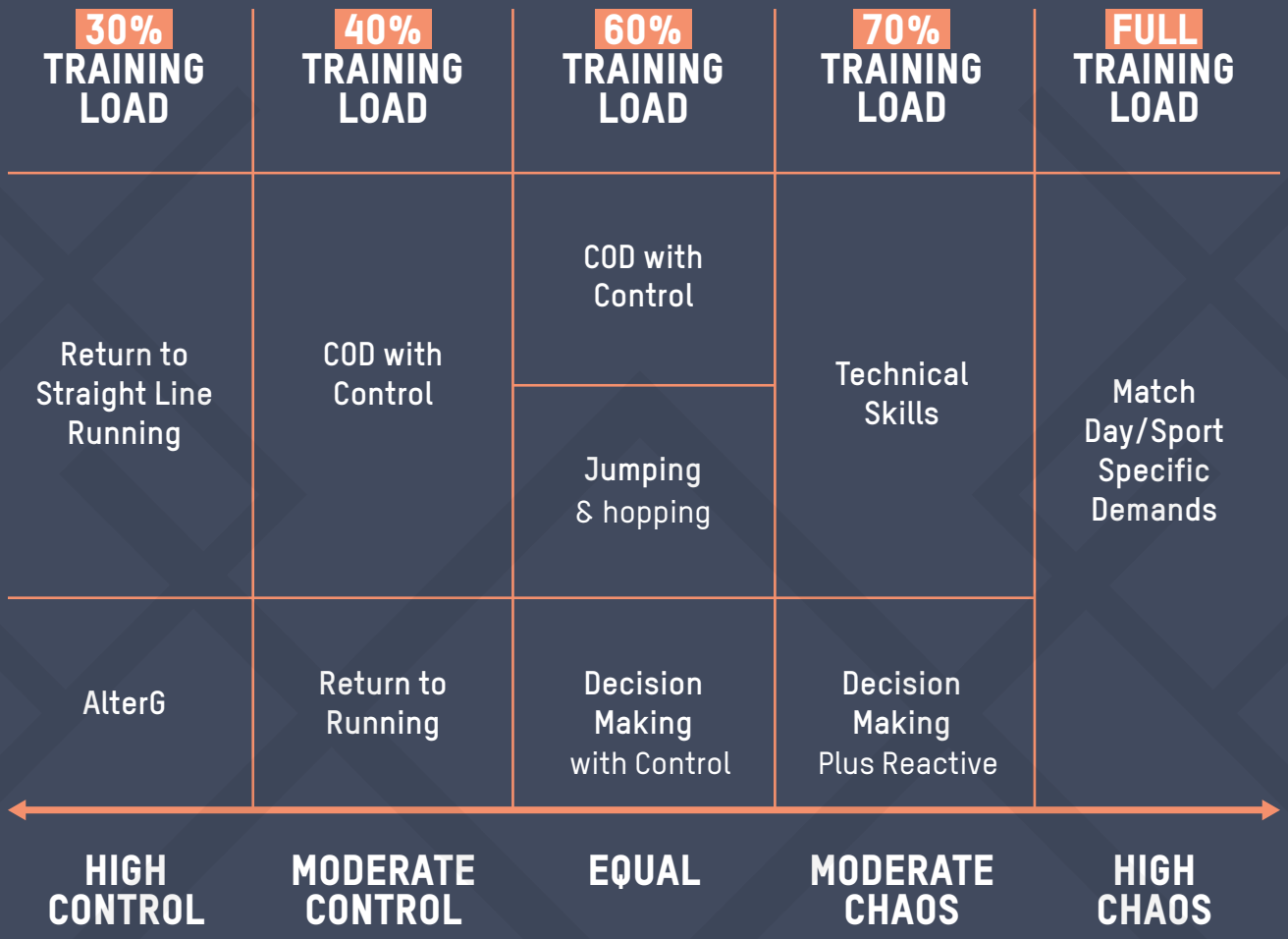
SPORT SPECIFIC TRAINING AND THE RETURN TO PERFORMANCE, THE END OF THE ROAD - KIND OF....

"YOU MAY FEEL MORE READY FOR SPORT THAN EVER."

If you have aspirations of returning to sport, this is the most important phase of your rehab and often one that has been overlooked by practitioners and patients in the past. It can be the most exciting phase but also the most frustrating as your exercises will start to become more specific to your sport, you may feel more ready for sport than ever.

This is where your strength and conditioning coach or suitably qualified AEP should be taking most of the reigns and also beginning to communicate more and more with your sports coaches to involve a seamless integration back into training.

CONTROL-CHAOS CONTINUUM



Adapted from: Taberner M, Allen T, Cohen DD. Progressing rehabilitation after injury: consider the 'control-chaos continuum 'British Journal of Sports Medicine 2019;53:1132-1136

Your training will now involve drills and exercises specific to your sport that begin to involve some variable situations and the unanticipated movements that you will experience in your sport. It is important to include drills that will test your ability to respond to all the situations that you might find yourself in when you are on the field or court. This may be a time where your running load increases if it is applicable to your sport. It will usually be a joint decision between yourself, your treating practitioners and your coaches on when the most appropriate time to re-integrate back into your sport may be. Again, using a criteria based approach is ideal in this scenario rather than time, however we must always pay respect to healing times.

This means that the final stage of ACL rehab is progressing from nice, predictable activities (like those found in the gym) and being able to produce force AND time the necessary forces in unpredictable environments. These are the tasks that are most like our sports, and require the most coordination from our bodies.

PHASE 4

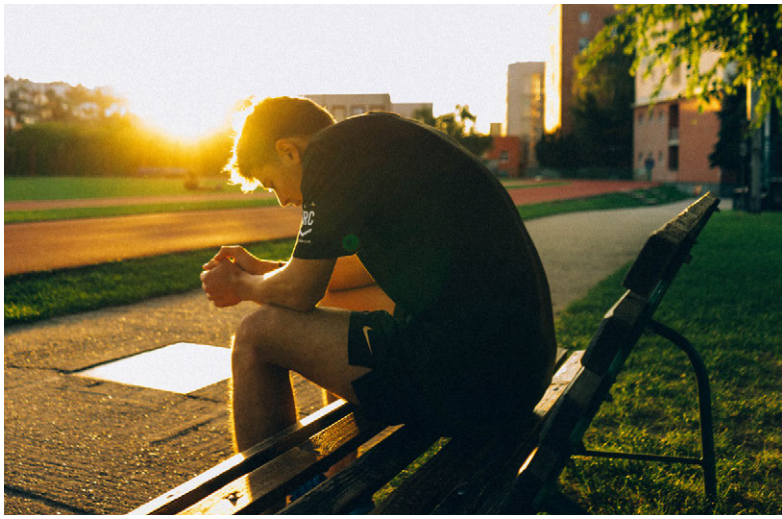
PSYCHOLOGICAL ASPECTS OF ACLR

With any lengthy stint in rehabilitation it normal to experience a change in emotional state. Being sidelined can evoke emotional responses to your injury including sadness, irritation, feelings of isolation, disengagement, lack of motivation, anger, frustration, changes in appetite, and even sleep disturbances. Some of the psychological factors that are pertinent to ACL Rehab are self-efficacy, fear of reinjury, psychological distress, and reduced locus of control. [7]

"THE NUMBER ONE IMPORTANT THING IN RETURNING TO PHYSICAL ACTIVITY OR SPORT IS THAT YOU NEED TO FEEL READY."

Studies have shown that of the multiple factors that can influence an athlete's ability to return to competitive sport, fear of reinjury was the most common reason cited for inability to function at preinjury levels. Also, lower psychological readiness (as measured by a psychological readiness scoring test) was in fact a risk factor for a second ACL injury in the under-20 age group. This is incredibly important as the number one factror in returning to physical activity or sport is that you need to feel ready. If you feel pressured or not ready then it could impact on re-injury rates and your future health. Make sure that you feel like you are in control of your rehab and only return when you feel ready.

There are 3 questionnaires that are generally used to ascertain whether or not you are ready to return to playing sport, The Tampa Scale of Kinesiophobia (TSK-11), IKDC Subjective Knee Evaluation Form and the ACL-RSI should all be implemented by your practitioner.



PHASE 4

SO HOW DO WE IMPROVE OUR PSYCHOLOGICAL READINESS TO RETURN TO PLAY SPORT? TREATING THE BRAIN BUT NOT FORGETTING THE SOUL.

An integrated approach that takes into consideration your feelings, thoughts and beliefs around returning to sport can assist in getting you back into doing what you love sooner.

As stated throughout this guide, it is important to consider your mental health throughout your entire journey of rehab and not just at the end. Traditional rehab in the past has been heavy on acknowledging the physical attributes of rehab consistently with paying respect to "how you are feeling" towards the end of the rehab continuum. Your rehab is so lengthy with an ACLR that it needs to be taken into consideration at every checkpoint of your rehab.

We know that the risk of re-injury and injury to the other side is higher if we don't believe that our knee can cope with the functional demands of sport . It is important to take your time with your rehabilitation and be honest with how you feel. If you don't feel that you are ready, then a joint conversation between your practitioner is ideal as you can start to highlight the aspects of your return to sport or activity that you don't feel comfortable with.

However, if you do feel ready and you have passed all the necessary testing to return to playing sport then congratulations! All your hard work has paid off and now is the time to enjoy it.

PHASE 5

PREVENTION OF RE-INJURY AND THINKING ABOUT THE LONG GAME.

Whilst phase five is the last phase, it should also be one that is long lasting and long term for athletes wishing to continue playing sport. It is ideal that during the time that you are playing sport, landing, cutting, COD and strength exercises should still be performed before training and games.

There are some great resources already available that can be used for prevention of injuries in Australian sports, such as:

- Prep to Play Coaching Manual - AFLW
- Sportsmetrics Program
- The 11+ Warm Up
- The PEP Program
- The KNEE Program - Netball Australia
- The FootyFirst Program - AFL

A meta analysis (the strongest form of research) has reported ACL injury prevention programs reduce all types of ACL injuries by 50%. This research also showed that ACL injury prevention programs can decrease non-contact ACL injuries in females by 67%.

It is likely that a program that involves lower limb strengthening, core strengthening, balance/ proprioception and movement drills that also looks at jumping and landing and changes of direction will garner the best outcomes.

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