

# THE KNEE PROGRAM

COACHING MANUAL



**KNEE:** knee injury prevention for Netballers to Enhance performance and Extend play



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# PREFACE

Netball is ranked as the leading women's participation team sport and the top team based sport in Australia for 15 to 24 year olds. Over 1.2 million participants enjoy the game nationally and Australia has been dominant on the international stage since 1963. Netball Australia has more than 350,000 registered members, 5,273 clubs nationally, 730 Associations, and eight Member Organisations.

Netball engages players of all ages from the entry level NetSetGO program, competitive and social recreational players and the elite level, with underage state and national programs through to the ANZ Championships and Australian Netball Diamonds. Regardless of the level of competition or motivation to play, netball is a great sport to develop health and fitness in a team based environment. As with any sport, there is an inherent injury risk to participants.

According to National Insurance data, the knee has now surpassed the ankle as the most common injury sustained by Australian netball players. Of these insurance claims, it is estimated that as high as 25% of all major injuries are attributed to Anterior Cruciate Ligament (ACL) injury alone. Not only is the ACL frequently injured, it is also arguably the most costly injury to netballers, resulting in prolonged rehabilitation periods and time away from the sport.

Netball Australia recognises that for players to be physically prepared for their participation in the sport there must be appropriate education and support for both players and coaches. The Knee injury prevention for Netballers to Enhance performance and Extend play (KNEE) program has been developed by Netball Australia with the support of the Australian Institute of Sport to provide this education for coaches, players and parents alike.

Using the principles of existing Injury Prevention Programs, Netball Australia's KNEE Program has been designed and tailored specifically for netball by Australian Netball Diamonds Head Physiotherapist, Alanna Antcliff. Implemented effectively it has the potential to reduce not only ACL incidence by up to 70% but reduce the incidence of lower limb injuries generally.

Through a national approach this program has the capacity to significantly contribute to the overall wellbeing of players at all levels of the sport and ensure the game's elite are on court more often, contributing to our success on the global stage.

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# INTRODUCTION

The Anterior Cruciate Ligament (ACL) is the main stabilizing ligament of the knee. Females are 4-6 times more likely than males to rupture the ACL ligament, with a further risk of injury to athletes participating in sports involving abrupt deceleration, twisting and pivoting. This places netballers at an extremely high risk of injury to the ACL and lower limbs.

There is a considerable volume of evidence to suggest injury prevention programs are effective in improving dynamic knee control and may reduce ACL injury risk by 30-70%. Furthermore such programs can reduce the incidence of lower limb injuries generally and significantly enhance performance.

Netball Australia's KNEE Program uses a combination of these principles and incorporates them into netball specific movement providing scope to reduce ACL and lower limb injury risk while enhancing strength, speed and power. It targets landing, deceleration and change of direction technique including attention to arm position to ensure preparedness for the multi-directional demands of netball.

The program has been tailored specifically for the demands of the sport and incorporates exercises both with and without balls. Coaches at all levels should make themselves familiar with the content, principles and approach to delivering the exercises to support their players development and minimise their injury risk.

## STRUCTURE

Research suggests using a combination of exercises is more effective in injury prevention than using one single element. Knowing this, the KNEE Program has been developed as a holistic warm up program utilising a number of different exercises and grouped under four categories.

It consists of simple exercises requiring minimal equipment with the inclusion of netball specific elements to ensure relevance. Coaches should note that there are a number of activities that fall under the sub sections of the Strength, Balance/Landing and Agility categories. These activities are provided for variety and coaches should choose one activity per sub section each time the program is delivered.

## CATEGORIES

### Warmup/Footwork

**Purpose:** To switch on the brain for activity and to prepare the body for movement, enhancing footwork patterning in preparation for dynamic activity.

**Implementation:** To be completed as a sequential process, all activities in the warm up/footwork category should be done at the start of the program each time.

### Strength

**Purpose:** Promote strength and develop a stable base upon which the body moves. It specifically targets the muscles that control the trunk, hips, pelvis and knees known to be protective of injury.

**Implementation:** One exercise from each section should be completed every time the program is delivered. For example the coach may choose one activity from each of quadriceps, gluteals/hamstrings and core sections of the Strength category each session.

### Balance/Landing

**Purpose:** To improve players ability to take off and land safely on single or double leg and capacity to absorb force in more challenging circumstances. Use of the ball during exercises further increases specificity of training, ensuring the overhead arm position required of most netball landings is focussed on and attended to.

**Implementation:** Four exercises from the Balance/Landing category should be completed every time the program is delivered. For example the coach may choose one activity from each of take-off/landing, single leg, double leg and repeated effort or a combination of these.

### Agility

**Purpose:** To develop a solid movement foundation upon which skills are honed. The agility exercises aim to improve movement efficiency when changing direction, decelerating and then reaccelerating. The agility category targets how to absorb force in landing/decelerating but also how to generate force when reaccelerating.

Use of the ball during tasks increases specificity of training. The elite program extends these principles further to accommodate not only pre-planned change of direction but also the response to unpredictable stimulus.

**Implementation:** Four exercises from the Agility category should be completed every time the program is delivered. For example the coach may choose one activity from each of running, deceleration, change of direction and netball plane of movement or a combination of these.

# AUDIENCE

The program has three target audiences, with activities tailored specifically to the needs of the participant:

## Junior

Players aged from 10-14 who are at varying stages of physical development and are starting to play and train with greater intensity and volume

## Recreational

Players aged 14 and older who are most likely playing at club and association level and training 1-2 times per week

## Elite

Players who have been identified in the Talent, Elite and Mastery category of Netball Australia's Athlete Pathway (see graphic)

FTEM	LTAD	NETBALL AUSTRALIA ATHLETE PATHWAY	DAILY TRAINING ENVIRONMENT (DTE)	SERVICED BY	COMPETITION	COACH
<b>M</b> <sup>1</sup> MASTERY	Sustained Success	Career Australian Netball Diamond Athletes	3-5 court work sessions /wk (this includes training & matches) 3-4 physical preparation sessions /wk 1 full day of recovery /wk	NA NCoE SIS/SAS Mo	World Netball Cup Commonwealth Games International Test Series	Head Coach - High Performance Assistant Coach - High Performance
<b>E</b> <sup>2</sup> ELITE	Success	Australian Netball Diamonds Squad/Team			ANZ Championship	Head Coach - High Performance Assistant Coach - Advanced
<b>E</b> <sup>1</sup> ELITE	Representation	ANZ Championship Programs			World Youth Championships International Series	Head Coach - High Performance Assistant Coach - High Performance
<b>T</b> <sup>4</sup> TALENT	Breakthrough/Reward	National 21/U Squad/Team Netball Centre of Excellence	3-4 court work sessions /wk (this includes training & matches) 2-3 physical preparation sessions /wk 1 full day of recovery /wk	NA MO	Australian Netball League International Series Inter Squad Matches	Head Coach - High Performance Assistant Coach - Advanced SIS/SAS Coach - Development
<b>T</b> <sup>3</sup> TALENT	Practice/Achieve	Australian Netball League Develop a Diamond Underage Program (National)			17/U National Netball Championship 19/U National Netball Championship 21/U National Netball Championship	Head Coach - Advanced Assistant Coach - Development
<b>T</b> <sup>2</sup> TALENT	Verification	Develop a Diamond Underage Program (State/Territory)			National 15/U School Sports	Head Coach - Advanced (or working towards) Assistant Coach - Development
<b>T</b> <sup>1</sup> TALENT	Demonstration of Potential	Develop a Diamond Academy Project	2-3 court work sessions /wk 2-3 sport/physical activity /wk 1 full day of recovery /wk	NA MO	State Titles Association Championships Association Tournaments Association/Club Competitions	Coach - Intermediate (14-16) Coach - Intermediate (11-13)
<b>F</b> <sup>3</sup> FOUNDATION	Sport Specific Commitment and/or Competition	Dare to Develop a Diamond 14-16 Dare to Develop a Diamond 11-13			'Set' Tier (ANZ NetSetGO modified rules)	Coach - Foundation or Community
<b>F</b> <sup>2</sup> FOUNDATION	Extension and Refinement of Movement	ANZ NetSetGO 'Set' Tier (8-10yrs) School Ambassador Programs			'Set' Tier (ANZ NetSetGO modified rules)	
<b>F</b> <sup>1</sup> FOUNDATION	Learning and Acquisition of Basic Movement	ANZ NetSetGO 'Set' Tier (5-7yrs) School Ambassador Programs				

# KEY PRINCIPLES

The majority of injuries in netballers occur on landing or changing direction, most often leading to injuries of the knee and ankle. 70% of ACL injuries are of a non-contact nature, meaning they are without the contact of another player. These typically occur in the following situations:

- landing with an inward collapse of the knee
- decelerating with a stiff knee
- are more common with single leg landings.

**The majority of injuries in netballers occur on landing or changing direction**



Landing and changing direction with poorly aligned knee positions places excessive force on the knee ligaments, which also occurs with abrupt deceleration when the knee is held stiffly. Abnormal loading is further intensified when the athlete is unable to adjust to rapid disturbances in posture. An example of this would be in a contested landing situation

As a coach it is important to be able to identify players who exhibit risky movements and understand how to support their development of a sound technique. Once identified, strategies can be adopted to encourage better technique and make the athlete move more efficiently in the process.

Of the four key principles, the first two involve take-off and landing.

In order to land well the athlete must first take off well. This initially needs to be rehearsed slowly, in a controlled environment. Once proficient the player needs to learn how to absorb force in landing and how to generate force with repeated take off efforts.

The final two principles involve how a player uses these landing principles in more dynamic circumstances. It focuses on maximising how forces are safely absorbed in decelerating and how to effectively generate force on re accelerating.

Opposite are the key points to identify what good technique should look like and what cues coaches should look for to identify poor technique. These key points will form the basis for supporting player development

	<b>GOOD TECHNIQUE</b>	<b>POOR TECHNIQUE</b>
<b>TAKE OFF</b>	<ul style="list-style-type: none"> <li>Feet shoulder width apart</li> <li>Feet facing forwards</li> <li>Hips bent</li> <li>Knees bent</li> <li>Knees in line with feet</li> <li>Use arms to drive movement</li> </ul>	<ul style="list-style-type: none"> <li>Feet wide</li> <li>Feet turning outwards</li> <li>Hips stiff/upright posture</li> <li>Knees stiff/upright posture</li> <li>Knees collapsing inwards</li> </ul>
<b>LANDING</b>	<ul style="list-style-type: none"> <li>Hips bent</li> <li>Knees bent</li> <li>Roll down through feet</li> <li>Feet straight ahead</li> <li>Knees in line with feet</li> <li>Trunk stable</li> </ul>	<ul style="list-style-type: none"> <li>Hips stiff/upright posture</li> <li>Knees stiff/upright posture</li> <li>Feet stiff</li> <li>Feet not aligned</li> <li>Knees collapsing inwards</li> <li>Poor posture</li> </ul>
<b>DECELERATION</b>	<ul style="list-style-type: none"> <li>Multiple small steps</li> <li>Hips bent</li> <li>Knees bent</li> <li>Chest up</li> <li>Trunk stable</li> </ul>	<ul style="list-style-type: none"> <li>1 large step</li> <li>Hips stiff/upright posture</li> <li>Knees stiff/upright posture</li> <li>Poor posture</li> </ul>
<b>CHANGE OF DIRECTION</b>	<ul style="list-style-type: none"> <li>Hips bent</li> <li>Knees bent</li> <li>Small steps</li> <li>Trunk stable</li> <li>Outside leg absorb the landing</li> <li>Inside leg drive acceleration</li> <li>Foot leads direction change</li> </ul>	<ul style="list-style-type: none"> <li>Hips stiff/upright posture</li> <li>Knees stiff/upright posture</li> <li>Wide stance with large step</li> <li>Poor posture</li> <li>Outside leg absorbs and drives</li> <li>Inside leg absorbs and drives</li> <li>Foot not leading direction change</li> </ul>

# HOW TO USE

The KNEE program and online resource has been designed for coaches to access on court or at home. The digital platform will allow coaches to engage with the resource via a tablet, smartphone, desktop or laptop depending on the circumstances. The adaptability of the resource will allow coaches to utilise it as a learning tool in the comfort of their own homes and also support delivery of the program on court.

## MANUALS:

The resource contains four manuals:

### Program Manual

This manual contains the general information about the program. It should be referred to by coaches to develop an understanding of the key principles, the target audiences, how to use the resource and key coaching points

### Junior, Recreational and Elite Manuals

these manuals contain the information specific to each level of the program. This includes the key principles, instructions for each exercise and key points for coaches and players

## KEY POINTS

### Players

Coaches should use these cues and language to make players aware of how their body should be feeling and moving as they participate in the activities. This is a crucial aspect of supporting players' development of correct technique

### Coaches

This information will support coaches understanding of specific cues to look for as players complete the activities and aid in coaches identifying areas to develop and highlighting excellent technique

### +/- ball

Coaches will come across this throughout the resource in different activities. It simply means this activity can be done with or without a ball and the instructions clearly articulate how to do this

## VIDEO

There are 100 individual exercises across the three programs. Each exercise has a demonstration video with voice over providing clear instruction on how players should complete the exercise as well as supporting technical information and athlete cues. Videos can be viewed individually or as a sequence for each category

Manuals can be accessed online in PDF form or can be printed if coaches prefer to have hard copies for their reference.

Videos can be accessed via a smart phone or tablet for on court reference when needed.

# KEY COACHING POINTS

## FAMILIARISATION AND PLANNING

- Coaches should spend time studying the content, key principles, instructions and coaching points before beginning the program with their players. It is important that coaches feel confident delivering the activities as well as understanding the key principles and how to support player development
- A key aspect of successful implementation is planning. The KNEE program should be utilised as the warm up aspect of the training session and therefore not impinge on the normal training structure or timeframes
- Encourage the players to familiarise themselves with the program. This involves the player in the process and places responsibility on them to have a sound working knowledge of the activities and key principles

## DEMONSTRATION AND IMPLEMENTATION

- Demonstrating activities is a vital aspect of the program. As all players learn differently it is important to give verbal instructions coupled with a demonstration of the activity highlighting correct technique. This combination of observation and practice enhances learning
- In the early stages of implementing the program players should be given the opportunity to slowly go through activities to understand how to move and the functionality required. This should happen each time a new activity is introduced
- As players and coaches gain confidence more focus can be applied to making players aware of areas to focus on. The combination of observation of correct technique and practice results in more effective learning
- Education forms the backbone of the program. Players should be educated on the importance of injury prevention and given ownership and responsibility to ensure they are engaged in the learning process. This is a key area of player-centred coaching, Netball Australia's preferred coaching approach

**Demonstrating activities is a vital aspect of the program.**

## GRADUAL INTRODUCTION

- Introduce sections of the program gradually over a period of weeks rather than all at once. This process allows for players to absorb and learn new information as well as facilitate skill mastery
- For example the Warm Up/Footwork section could be introduced in isolation over two weeks. Once proficient, strength exercises could be added and so on until all elements of the program are included in the team warm up

**It is important to vary the exercises as appropriate to ensure continued motivation and transference of skill**



**The provision of feedback is essential to the success of the program to ensure risky movements are eliminated**



## VARIABILITY

- Multiple exercises are provided within each section to provide variability and allow for progression. It is not intended that a player perform every exercise during a warm up. It is preferable to keep it simple by performing fewer exercises well than multiple exercises poorly
- It is important to vary the exercises as appropriate to ensure continued motivation and transference of skill. Try not to have the program look exactly the same each session

## SMART PHONE AND TABLET

- Visual feedback is a great way of raising players' awareness of their areas for development. Using a smart phone or tablet can assist players in understanding aspects of their technique that require refinement and will lead to skill acquisition
- Before videoing a player to provide technical feedback it is imperative you gain permission from the player or parent

## FEEDBACK

- The provision of feedback is essential to the success of the program to ensure risky movements are eliminated
- Coaches should provide players with 'external feedback' using analogies that emphasise the desired result of the movement, rather than focusing on actual body position. As an example a coach may instruct a player to 'imagine sitting back in a chair' when landing, as opposed to 'bend your knees' when landing. Medical research has shown this subtle difference in feedback delivery produces a faster and more effective improvement in skill
- The timing of this feedback is also critical. Aligning with player centred coaching principles, coaches should make players aware of technical faults and empower them to be responsible for their development in this area. Coaches should always be guiding this development process
- It is important that the provision of feedback is variable. Initially players require more frequent feedback, however as technique improves it is important that feedback is reduced to prevent dependence
- Feedback can be visual also. Many activities involve players facing each other which allows for immediate feedback on correct or incorrect technique whilst promoting motivation for improvement

# COMPLIANCE

For maximum effectiveness the program must be completed 2-3 times per week and must be continued for the effect to be maintained. Correct technique is imperative in developing maximum effectiveness, therefore coaches need to be aware of not only 'how' to do the activities but also what to look for to support players in their development. The videos show examples of what correct technique should look like.

The program does not contain static stretching as recent evidence suggests static stretching prior to activity does not have a protective effect of injury. Regular stretching away from training may however be appropriate to implement as required. A list of suggested stretching exercises have been provided in this resource.

## REFERENCES

- Alentorn-Geli, E., Myer, G.D., Silvers, H.J., Samitier, G., Romero, D., Lázaro-Haro, C., & Cugat, R. (2009). Prevention of non-contact anterior cruciate ligament injuries in soccer players. Part 2: a review of prevention programs aimed to modify risk factors and to reduce injury rates. *Knee Surgery, Sports Traumatology, Arthroscopy*, 17 (8), 859-79.
- Benjaminse, A., Gokeler, A., Dowling, A.V., Faigenbaum, A., Ford, K.R., Hewett, T.E., Onate, J.A., Otten, B., & Myer, G.D. (2015). Optimization of the anterior cruciate ligament injury prevention paradigm: novel feedback techniques to enhance motor learning and reduce injury risk. *Journal of Orthopaedic and Sports Physical Therapy*, 45 (3), 170-182.
- Herbert, R.D., & Gabriel, M. (2002). Effects of stretching before and after exercising on muscle soreness and risk of injury: systematic review. *British Medical Journal*, 325 (7362), 468.
- Maffulli, N., & Caine, D. (2012). The Younger Athlete. In Brukner, P., & Khan, K. *Clinical Sports Medicine* (4th ed.) (pp901). Australia: McGraw-Hill Australia Pty Ltd.
- Myer, G.D., Ford, K.R., & Hewett, T.E. (2004). Methodological approaches and rationale for training to prevent anterior cruciate ligament injuries in female athletes. *Scandinavian Journal of Medicine and Science in Sports*, 14 (275-285).
- Myer, G.D., Sugimoto, D., Thomas, S., & Hewett, T.E. (2013). The influence of age on the effectiveness of neuromuscular training to reduce anterior cruciate ligament injury in female athletes. A meta-analysis. *The American Journal of Sports Medicine*, 41 (1) 203-215.
- Myklebust, G., Engebretsen, I., Braekken, I.H., Skjølberg, A., Olsen, O.E., & Bahr, R. (2003). Prevention of anterior cruciate ligament injuries in female team handball players: a prospective intervention study over three seasons. *Clinical Journal of Sports Medicine*, 13, 71-78.
- Postma, W.F., & West, R.V. (2013). Anterior cruciate ligament injury prevention programs. *The Journal of Bone and Joint Surgery*, 95A (7), 661-669.
- Saunders, N., Otago, L., Romiti, M., Donaldson, A., White, P., & Finch, C.F. (2010). Coaches' perspectives on implementing an evidence-informed injury prevention programme in junior community netball. *British Journal of Sports Medicine*, 44, 1128-1132.
- Stojanovic, M.D., & Ostojic, S.M. (2012). Preventing ACL injuries in team-sport athletes: A systematic review of training interventions. *Research in Sports Medicine: An International Journal*, 20 (3-4), 223-238.
- Sugimoto, D., Myer, G., Barber Foss, K., Hewett, T. (2015). Specific exercise effects of preventive neuromuscular training intervention on anterior cruciate ligament injury risk reduction in young females: meta-analysis and subgroup analysis. *British Journal of Sports Medicine*, 49 (5), 282-289.
- Swart, E., Redler, L., Fabricant, P.D., Mandelbaum, B.R., Ahmad, C.S., & Wang, C.Y. (2014). Prevention and screening programs for anterior cruciate ligament injuries in young athletes. *The Journal of Bone and Joint Surgery (American)*, 96 (9), 705-711.
- Voskanian, N. (2013). ACL injury prevention in female athletes: review of the literature and practical considerations in implementing an ACL prevention program. *Current Reviews in Musculoskeletal Medicine*, 6 158-163.
- Women in Sport: The state of play (2013) Australian Bureau of Statistics, Perspectives on Sport.
- Yoo, J.H., Lim, B.O., Ha, M., Lee, S.W., Oh, S.J., Lee, Y.S., & Kim, J.G. (2010). A meta-analysis of the effect of neuromuscular training on the prevention of the anterior cruciate ligament injury in female athletes. *Knee Surgery, Sports Traumatology, Arthroscopy*, 18, 824-830.

### Online Examples

**FIFA 11+**  
[f-marc.com/11plus/home/](http://f-marc.com/11plus/home/)

**Santa Monica Sports Medicine Foundation Performance Enhancement Program**  
[smsmf.org/smsf-programs/pep-program](http://smsmf.org/smsf-programs/pep-program)

**Skadefri!**  
[klokavskade.no/no/Skadefri/Handball2/Unnga-korsbands-kader/](http://klokavskade.no/no/Skadefri/Handball2/Unnga-korsbands-kader/)

**Activate GAA Warm Up**  
[activategaa.sini.co.uk/](http://activategaa.sini.co.uk/)

**LARP Team Prep**  
[laurusrehab.com/](http://laurusrehab.com/)

# CREDITS

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