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Injury Reduction..

How can coaches reduce the athlete's risk of serious knee injury?

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AFL

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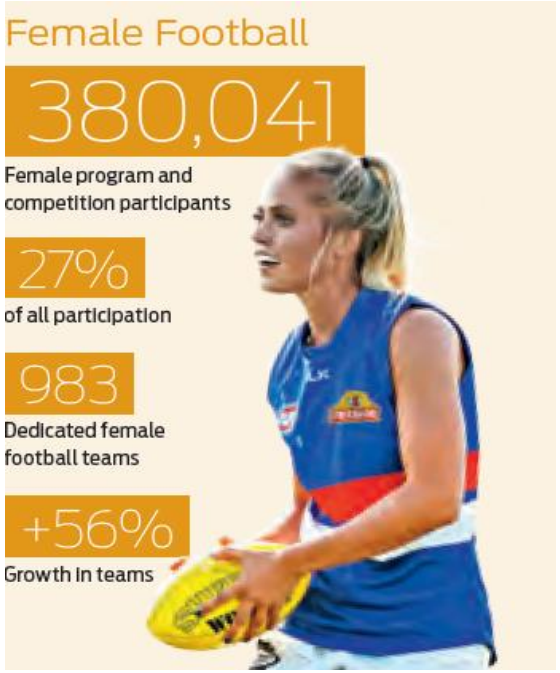
CENTRE FOR SPORT AND SOCIAL IMPACT



https://www.gladstoneobserver.com.au

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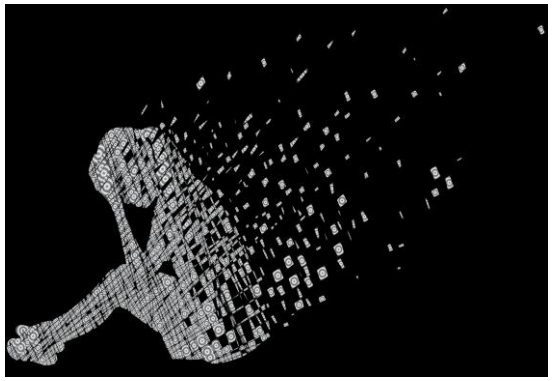
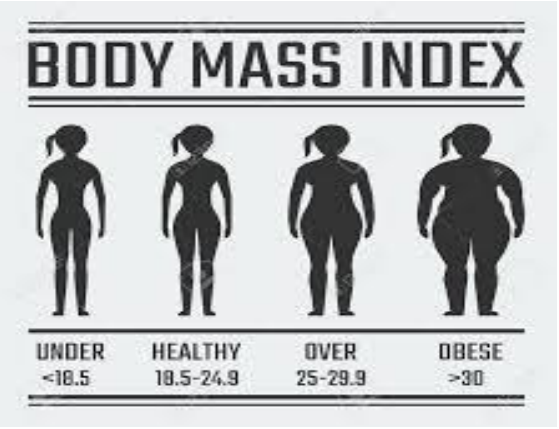
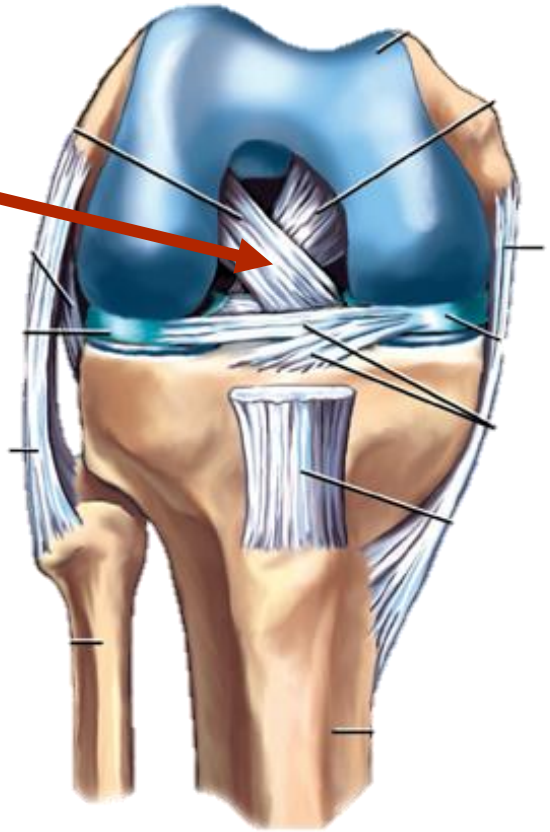




Knee injuries in AFLW

Anterior cruciate ligament



Anterior Cruciate Ligament (ACL) is the main stabilising ligament in the knee

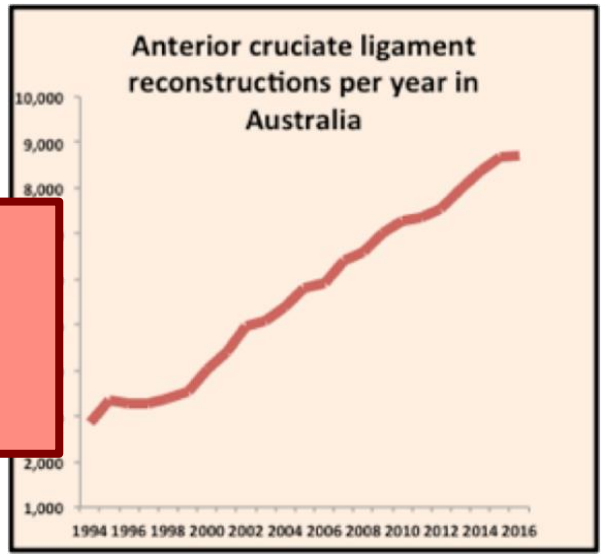
ACL rupture is the most serious knee injury, often needing surgical reconstruction

Most players need at least one year to return to sport following ACL reconstruction

Over 10,000 ACL injuries
in Australia annually

ACL INJURIES

ACL reconstructive surgery is increasing by 6% per annum in Australia



Created from freely available Medicare data and likely to under estimate

Research

Increasing rates of anterior cruciate ligament reconstruction in young Australians, 2000–2015

David Zbrojkiewicz[1,2], Christopher Vertullo[1,3], Jane E Grayson[4]

Zbrojkiewicsz et al., Med J Aust (2018);

HOW IS THE ACL RUPTURED?

Non-contact mechanism

- 70-80% in females
- 50-60% in males

1. Deceleration & change of direction
2. Landing

Contact mechanism

- Less common
- Less preventable

Cochrane (2007)

Australian Football ACL Injury Mechanisms

Non-contact

- Deceleration and change of direction

Australian Football ACL Injury Mechanisms

Non-contact

- Deceleration and change of direction

In **response (reactive)** to play

Overstride, hip and knee extended

Foot plant, outside base of support

Body positioning (trunk, lower limb and foot) pointing away from intended direction of travel

Australian Football ACL Injury Mechanisms

Non-contact

- Landing

Dynamic knee valgus (**knee collapse**)

Results from **thigh turning inwards**, and **lower leg turning outwards** (or planted foot)

May or may not be associated with:

- **contact in air/on landing**
- **Landing on straight knee**
- **Torso off balance**

Australian Football ACL Injury Mechanisms

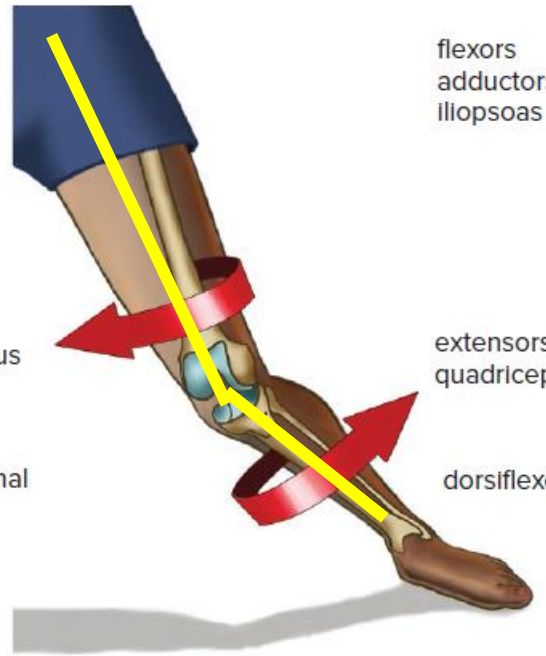
Non-contact

- Deceleration and change of direction

Non-contact

- Landing

	muscles involved	Position of safety	body position	body position	Point of 'no return'	muscles involved
back			normal lordosis	forward flexed, rotated opposite side		
hips	extensors abductors gluteals		flexed neutral abduction adduction, neutral rotation	adduction internal rotation		flexors adductors iliopsoas
knee	flexors hamstring		flexed	less flexed, valgus		extensors quadriceps
tibial rotation	plantar flexors		neutral	internal or external		dorsiflexors
landing pattern	gastrocnemius posterior tibialis		both feet in control balanced	one foot out of control unbalanced		peroneals tibialis anterior



Priority Area for Coaches

Impact of ACL injury on athlete and team

10 / 30 players have had a serious knee injury / ACL

Priority Area for Coaches

Negative effect on team dynamics

Loss of time for player development

Impact on Team

Financial cost, use of resources

Loss of player availability affects team success

Risk of future injury

Risk of never returning to sport, or to the same level of performance

Impact on the athlete

Long term health (e.g. arthritis)

Psychological impact/ quality of life

Direct financial costs

Knee injuries in AFLW

Isn't this normal for females playing contact balls sports?

Data from soccer, basketball, rugby, handball:

- Women 0.82 - 2.29 per 1000 player hours
- Women 2 - 5 greater risk (than men with same exposure)

Renstrom (2008); Smith (2012); Prodromos (2007)

What about in sub-elite populations?

Open Access Research

BMJ Open Sport & Exercise Medicine

Priorities for injury prevention in women's Australian football: a compilation of national data from different sources

Lauren V Fortington, Caroline F Finch

Injuries in Australian Rules Football: An Overview of Injury Rates, Patterns, and Mechanisms Across All Levels of Play

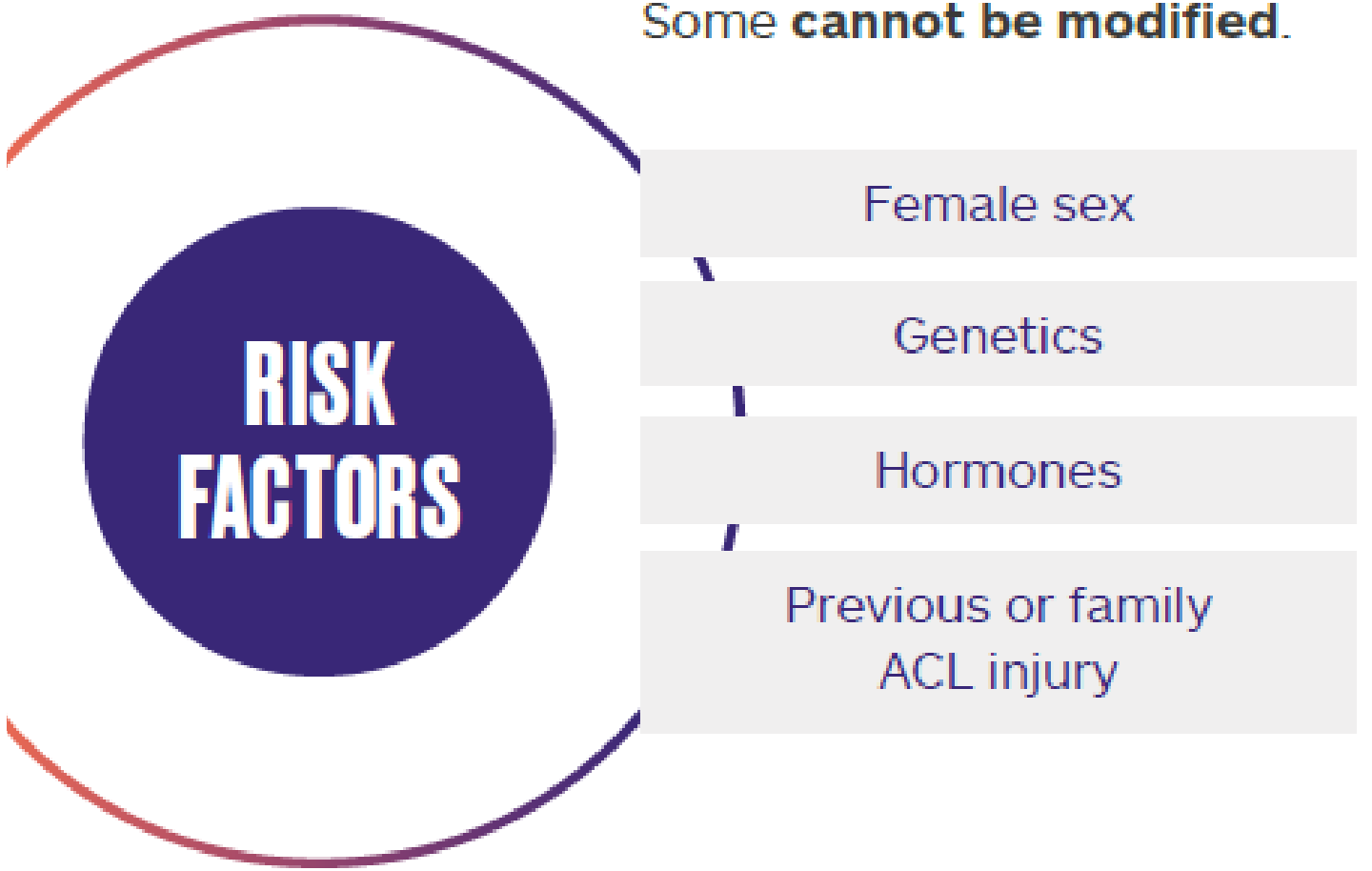
Richard Saw, MBBS(Hons),*† Caroline F. Finch, PhD, MSc, BSc(Hons),‡ David Samra, MBBS(Hons), BAppSci(Physio),§ Peter Baquie, MBBS,† Tanusha Cardoso, MBBS,‖ Danielle Hope, BMedSci(Hons),¶ and John W. Orchard, MBBS, BA, PhD#

- Limited data
- Serious knee injuries
- Head, neck and upper limb injuries

Feasible injury surveillance required to understand priorities and effectiveness of interventions

What are the risk factors?

Many factors may interact to contribute to a serious knee injury

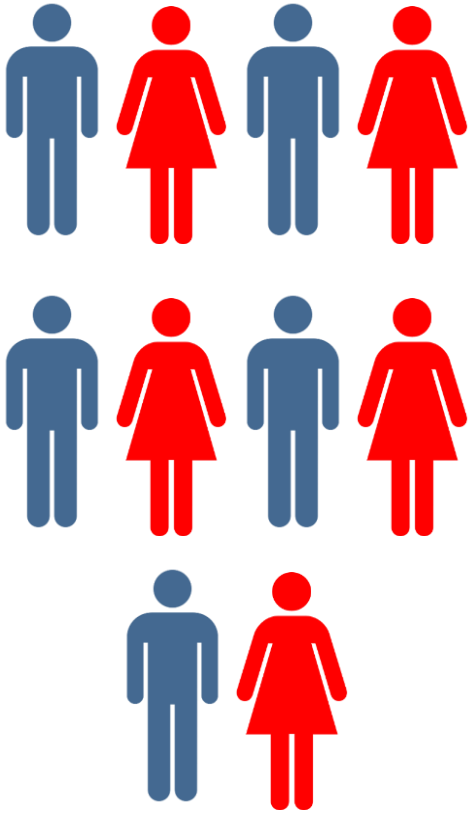


Renstrom (2008); Smith (2012); Prodromos (2007)

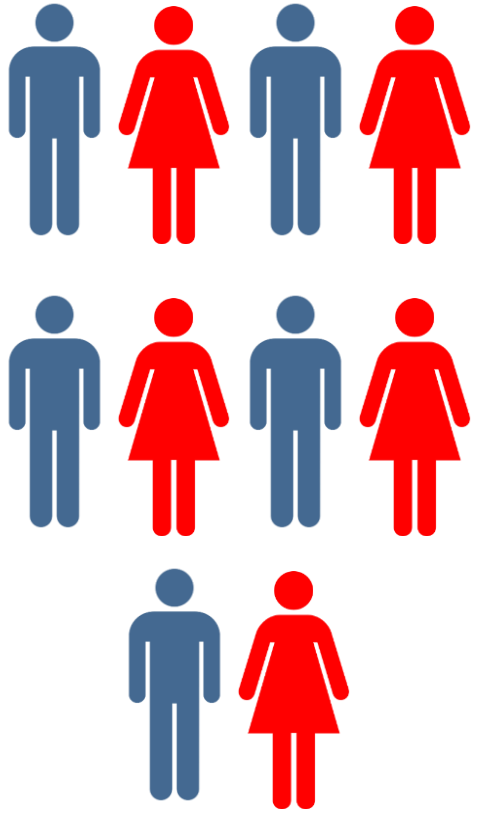
The risk of injury can be reduced

The risk of injury can be reduced

Intervention Group



Control Group

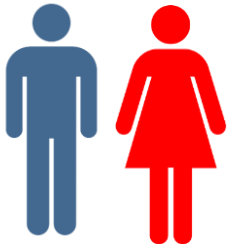


The risk of injury can be reduced

Intervention Group

2 injured

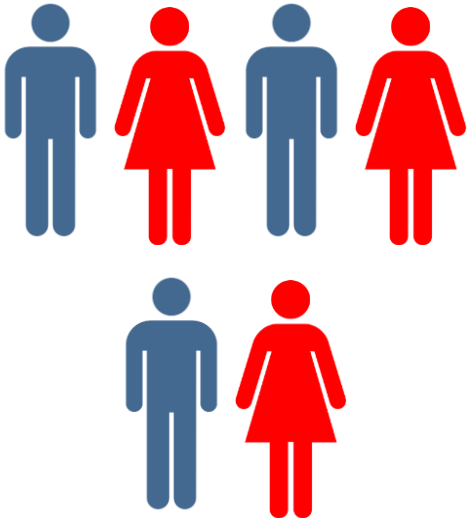
10 people



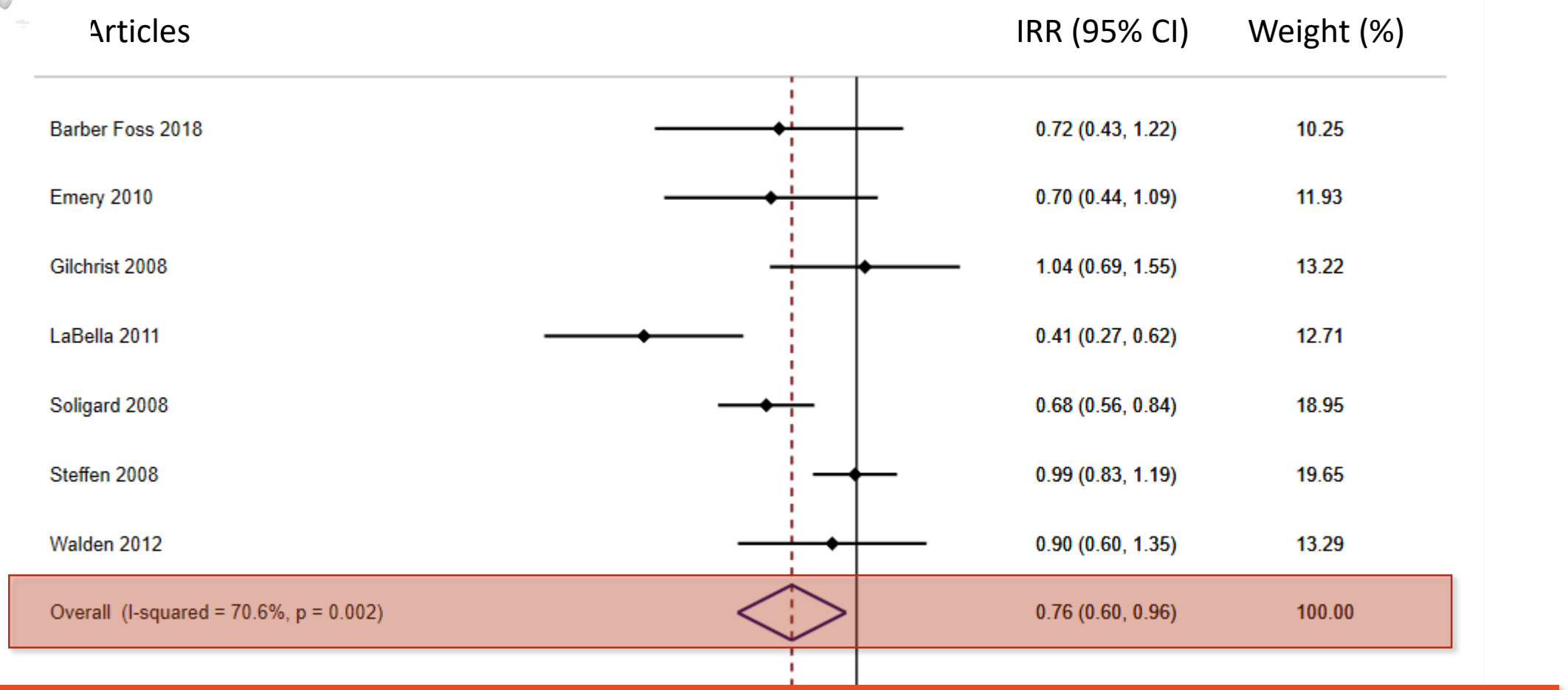
Control Group

6 injured

10 people



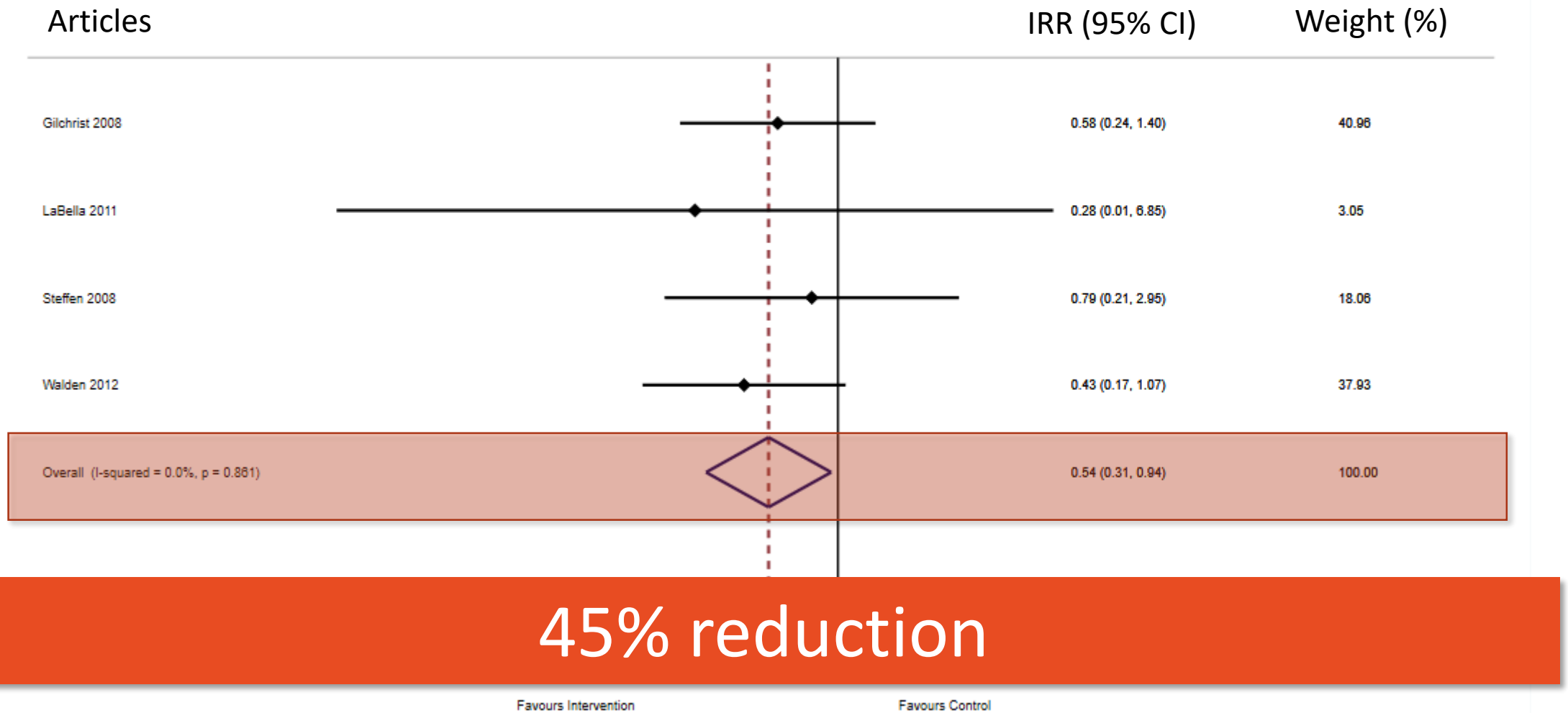
Overall injury reduction in Women's football



25% reduction

*Mentiplay et al, unpublished data

ACL injury reduction in Women's football



45% reduction

*Mentiplay et al, unpublished data

What are the **other benefits** of injury reduction programs?

Increased athletic **performance**
(speed, vertical jump, agility, strength

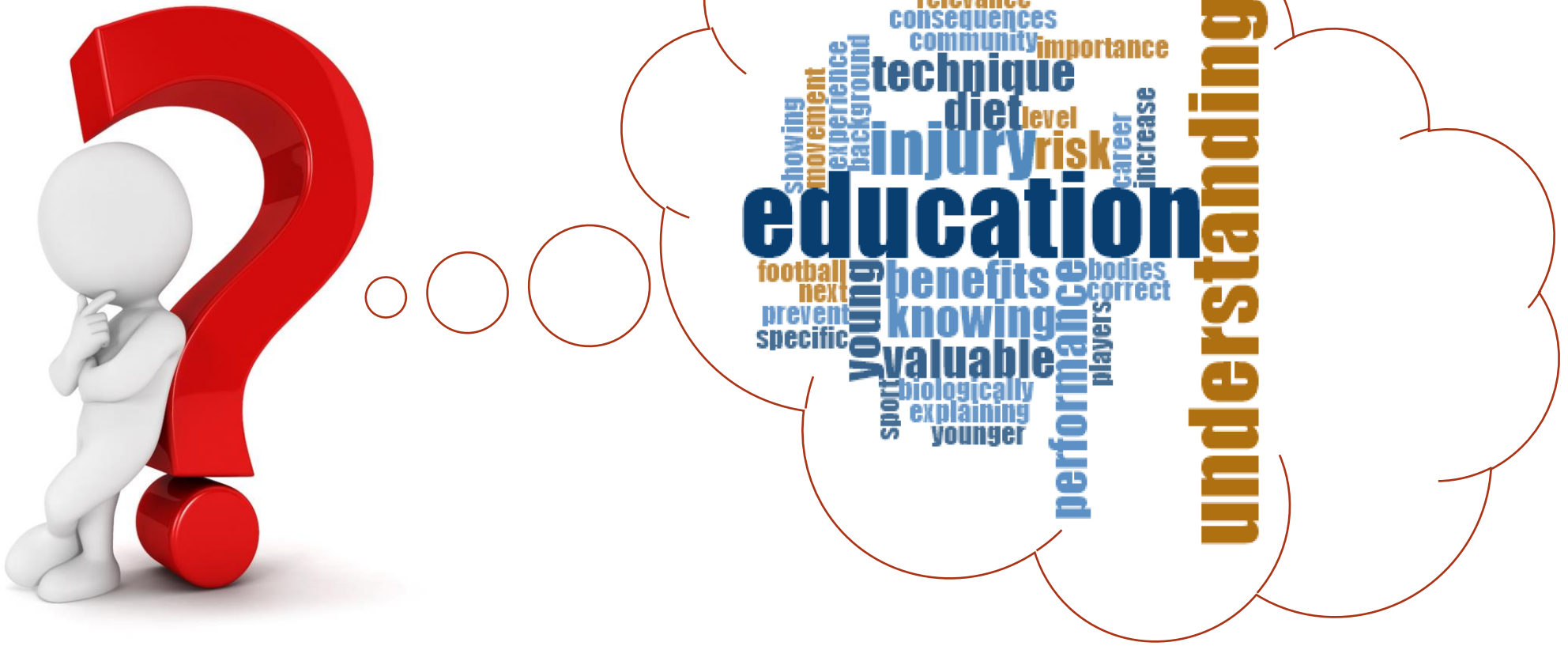
Increased player **availability** for games

Increased chance of winning games

Myer 2005; Hagglund 2013

What are the **critical elements** of an **injury risk reduction program** in elite Australian football??

What do the athletes think??



Evidence-based, women's football specific IRR program is

- Designed specific to the female footballer
- Supervised by staff with appropriate experience
- Includes immediate feedback to assist with technique
- An appropriate pre-season period to allow for players to learn new skills and modify movement patterns
- Consistent across all AFLW clubs

Summary of Recommendations from Interviewed AFLW Physiotherapists (n=3)

What do the physiotherapists think??

Blog | British Journal of Sports Medicine

Triple play in ACL injury prevention: beyond the usual suspects.

Posted on October 4, 2018 by BJSM

By Drs Anne Benjaminse @AnneBenjaminse and Alli Gokeler @AlliGokeler

4

Lack of facilities/resources?

Leadership/knowledge?

Training time/link to training goals?

Player enjoyment/engagement?

…..takes too long?

…..boring?

…..no performance benefits?

Why is uptake of IRR programs low??

Is co-creation the key??

Blog | British Journal of Sports Medicine

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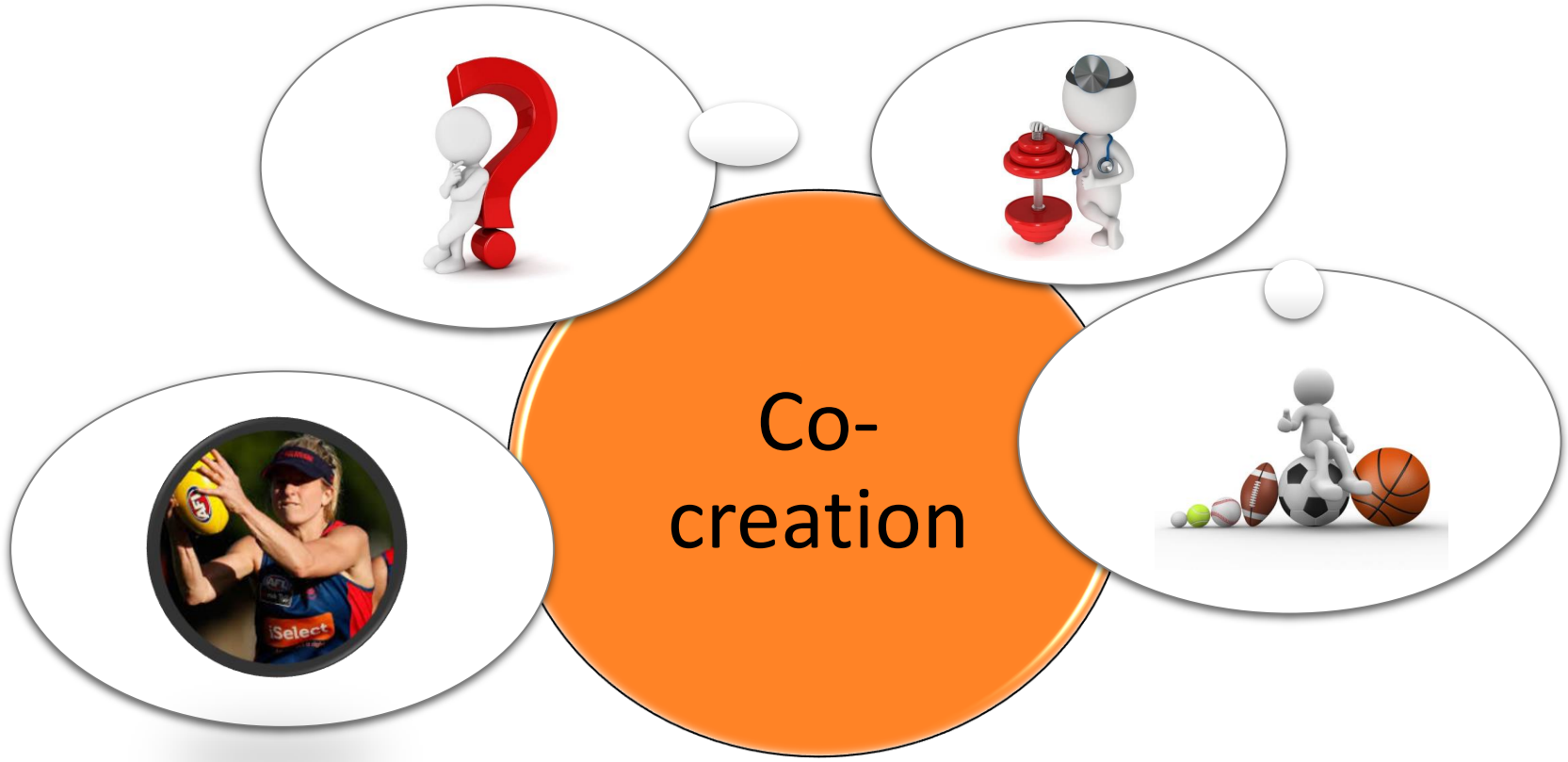

Train the Trainer

Ownership

Knee injury risk reduction program for elite female Australian Footballers

Chief Investigator: Professor Kay Crossley
Co-Investigators: Dr Andrea Bruder, Dr Andrea Mosler, Dr Alex Donaldson, Brooke Patterson

Partners: AFL Research Board, AFL Physiotherapist's Association

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Player Perspective

1. Influence of **wellbeing** underestimated
2. **Learning from other sports** & pathway programs & considerations for **cross-coders**
3. Wanting to know why – **knowledge is power**
4. Dealing with **injured players– tips for coaches**
   - Fear of re-injury
   - Culture

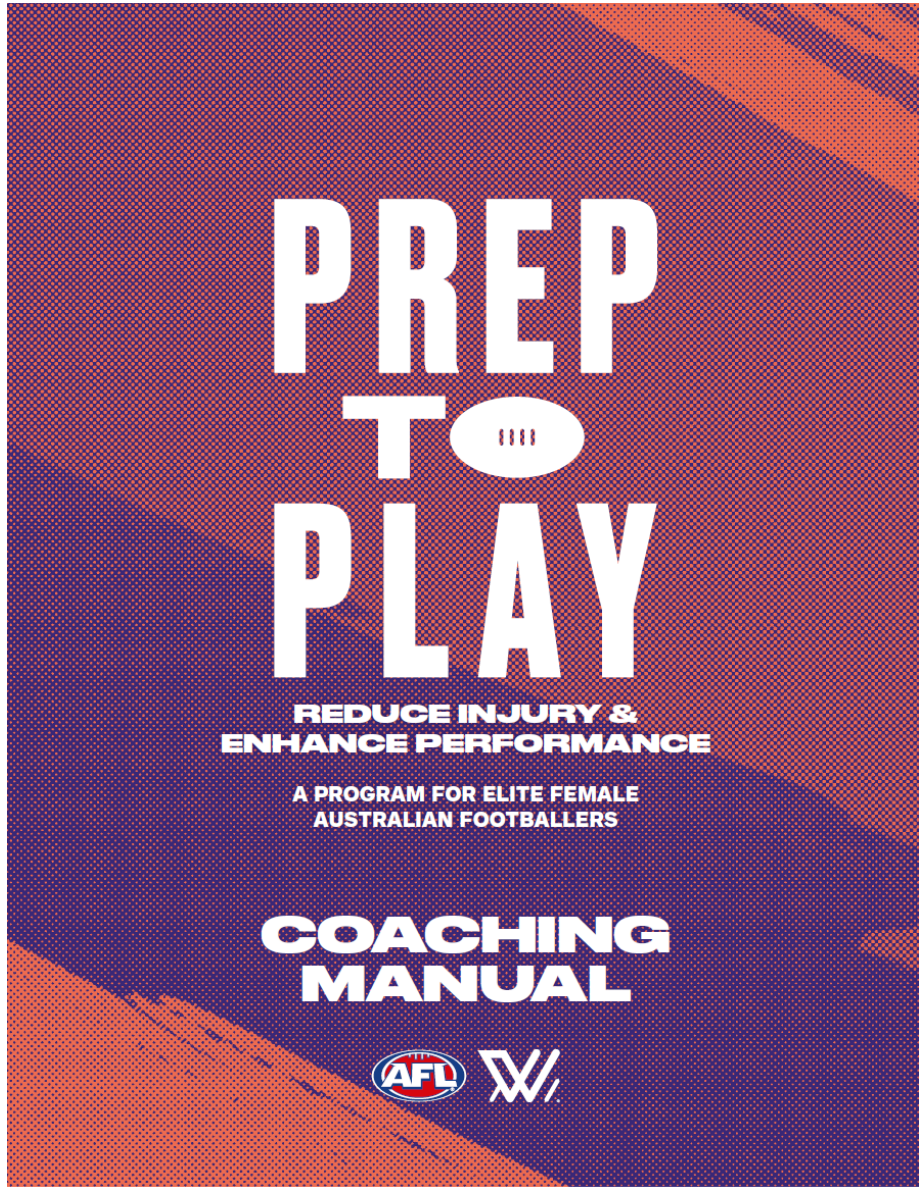
What are we doing?

Program Development

- Co-creation process specific to AFLW
- Variety of resources for staff & players

Next steps

- Working with coaches
- Community-level adaptation
- Improving injury surveillance and implementation of programs



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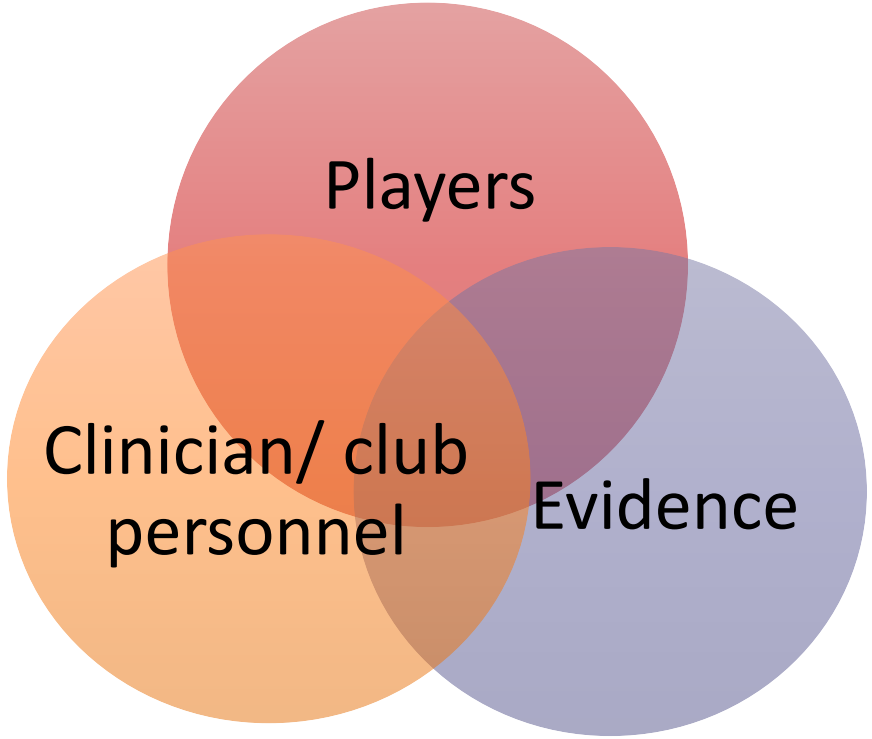
Information was collated during a collaborative project with the AFL and La Trobe University and is informed by best available evidence and expert opinion from coaches, players and staff.

Prep to Play Development

1. **Concept mapping** (n=27) & **focus group** process (n=32)

- Identify critical elements and resources required for IRR program
- AFLW Players
- Staff from AFLW, AFLM
- Elite female team ball sports
- All AFLW teams represented



PREP TO PLAY COMPONENTS

- Co-creation + informed by previous research[6] [7] [8] [9] [10] [11] shown to reduce the risk of ACL injury and enhance performance
- We do not know which components of the programs are most effective
- Current recommendation - all components should be completed until further research is conducted in the female Australian Football population

Guiding Priorities

Understanding how knee injuries happen

Decelerating and changing direction ACL injury mechanism

Landing on one leg ACL injury mechanism

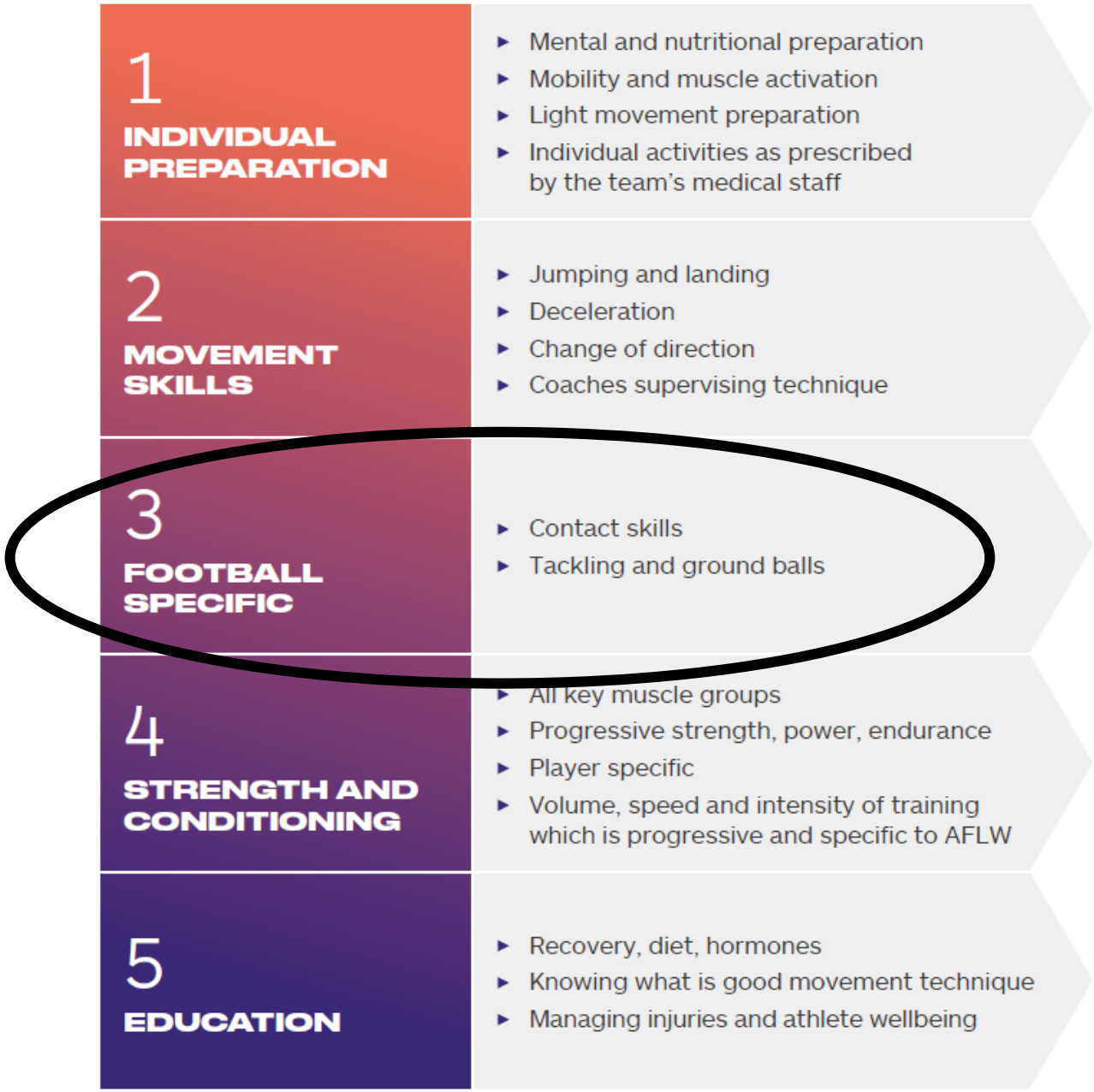
70-80% of ACL injuries occur in non-contact mechanisms

This trend appears consistent in AFLW

Therefore this program focusses on 3 key movement skills;

- **Jumping and landing**
- **Deceleration**
- **Change of direction**

PREP TO PLAY COMPONENTS



Understanding how head and upper limb injuries happen

Hence, focus on 2 key football skills (not limited to);

- Tackling
- Ground balls

MOVEMENT SKILLS

COACH PRACTICAL

Refer to handout

Can be completed as part of **normal warm-up**

Replace 2-lap jog and static stretching

KEY FOCUS: MOVEMENT SKILLS

JUMPING AND LANDING

CHANGE OF DIRECTION

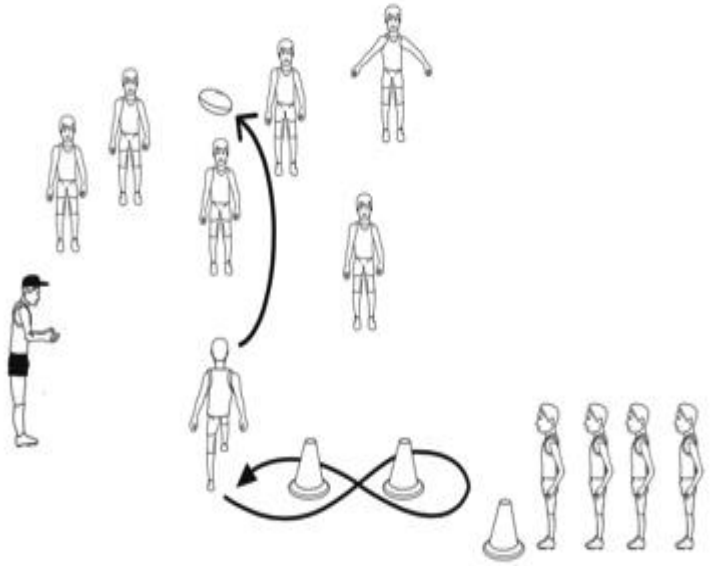
DECELERATION

AFL IS A 360° SPORT

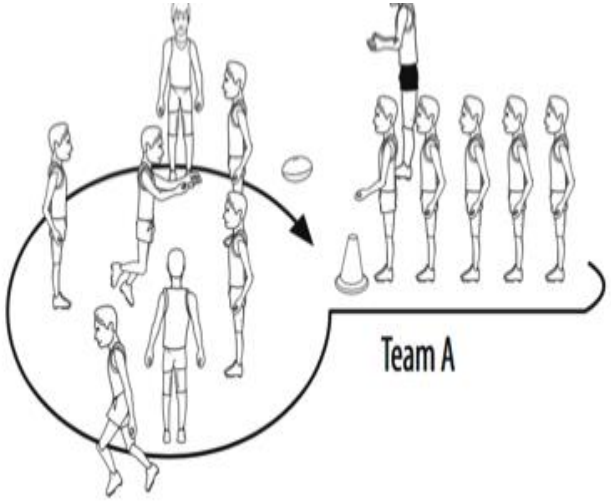
These skills will help your players move better and respond to what's going on them efficiently

SET UP – Handout

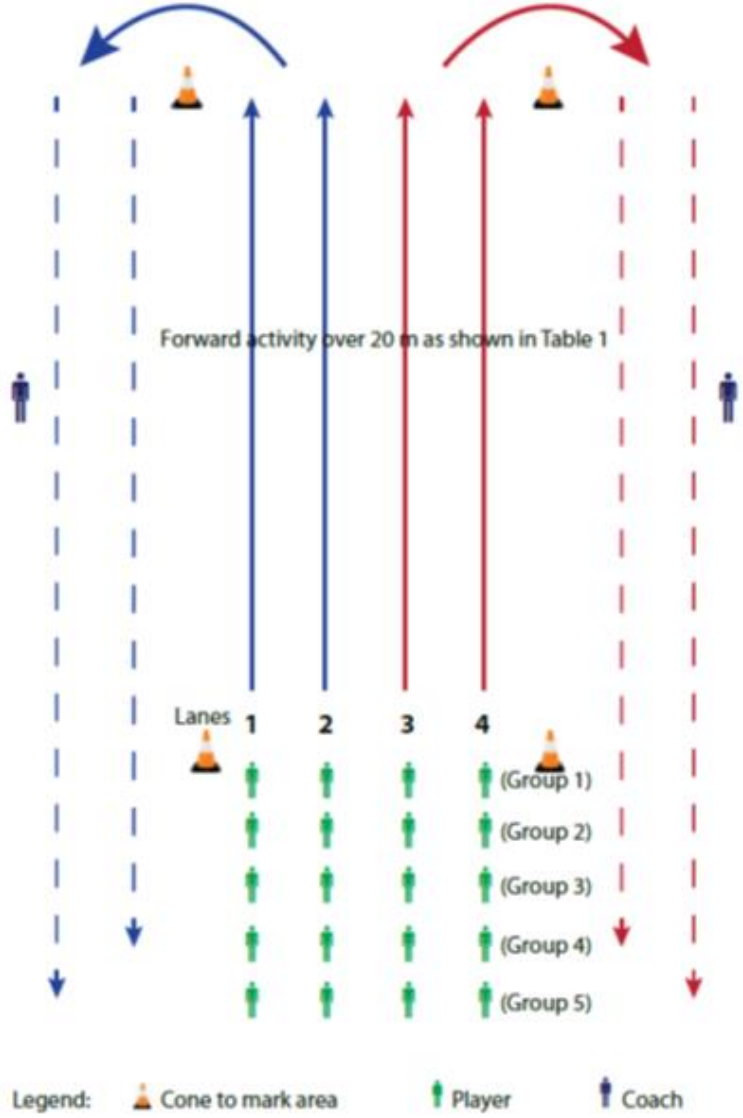
- Vary according to age and level of ability
- Be creative in developing motor skills – they are concepts – not set drills.
- Incorporate into fun games, using footballs.



Continous Football from CoachAFL



Sprinters vs Handballers from CoachAFL



Set up FootyFirst program

COACH PRACTICAL

JUMPING AND LANDING

Performance Benefits

- Jump higher to mark
- Be stronger in the air
- Land with balance – NEXT PLAY READY

GOOD TECHNIQUE

- **Land in athletic stance** to be NEXT PLAY READY
- **Get low** and bend through hips and knees to absorb load
- Keep hips, knees, feet and torso in line with each other
- Keep hips level

POOR TECHNIQUE

- Stiff legs on landing (ie. not bending hip/knee)

- Hip dropping

- Torso leaning to the side

- Knees collapsing inwards
- Landing heavy and unable to quickly take off
- Unbalanced

JUMPING AND LANDING

Performance Benefits

- Jump higher to mark
- Be stronger in the air
- Land with balance – NEXT PLAY READY

COACH PRACTICAL SESSION

PREP TO PLAY

DECELERATION

Performance Benefits

- Deceleration is the ability to have short quick steps when approaching a contest. This will ensure you execute tackles and skills well
- Improve ability to quickly prepare feet and get in best position for handball receive

GOOD TECHNIQUE

- **Busy feet** with short quick steps on balls of feet
- **Get low** by bending knees and hips

POOR TECHNIQUE

- Over-striding with large, long, heavy steps
- Upright posture
- Sinking into ground

DECELERATION

Performance Benefits

- Deceleration is the ability to have short quick steps when approaching a contest. This will ensure you execute tackles and skills well
- Improve ability to quickly prepare feet and get in best position for handball receive

COACH PRACTICAL

CHANGE OF DIRECTION

Performance Benefits

- Increased agility – to dodge players and not get tackled
- Fast responses to changes in play – the ball, opposition player

GOOD TECHNIQUE

- Slow down as needed with **busy feet**
- **Get low** and balanced, ready for any direction
- **Turn body** to face direction you want to go
- Keep feet inside base of support
- **Plant and push** the ground away with outside leg

POOR TECHNIQUE

= High risk position with increased ACL strain

- Large, long, heavy preparation steps
- Upright posture

- Foot too far outside base of support

- Leg and foot pointing in opposite direction to the way you want to go
- Torso leaning away from direction you want to go

CHANGE OF DIRECTION

Performance Benefits

- Increased agility – to dodge players and not get tackled
- Fast responses to changes in play – the ball, opposition player

HOW TO DELIVER FEEDBACK

Strategies which may enhance motor learning in complex football-specific activities[16] include:

1. External or goal-related cues[17]. Use external cues such as "get low" rather than describing coordination of body parts such as "bend your hip and knee"

2. Give positive feedback on correct trials to increase confidence, motivation and movement automaticity. Prompt players to note how good trials feel, or the output of that trial (i.e. higher jump)[18]

3. Teammate feedback. Once competency is established, get players to observe each other and provide feedback:
= increased competition, motivation[19]

SIMPLE, "EXTERNAL" CUEING

POSITIVE

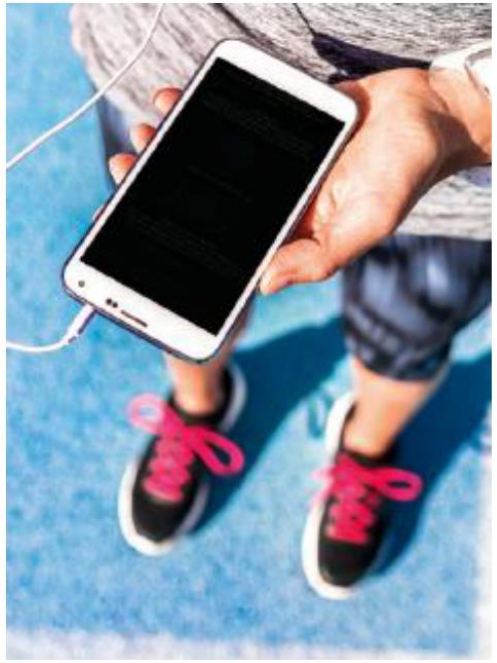
PREP TO PLAY

MENSTRAL HEALTH

WHY IS MENSTRUAL HEALTH RELEVANT?

- Managing symptoms and hormones is an important part of managing your general health and wellbeing
- This may impact your energy levels, injury risk and sport performance

A regular cycle is healthy, and should occur every 4-6 weeks.



There are many useful apps (i.e. FITR Woman) with links to information to help you monitor and manage your menstrual cycle, which may improve symptoms, wellbeing and performance.

WHEN SHOULD I ASK FOR HELP?

If you have the following symptoms:

- Period that is delayed, irregular or has stopped
- Cramps
- Excessive bleeding
- Low energy
- Tender breasts
- Any other irregular symptoms

You may need to:

- Speak to your medical team to modify your training program
- Speak with your medical team / GP

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THANK YOU

AFL Research Board (Patrick Clifton); AFLPTA

La Trobe University Sport, Exercise & Rehabilitation Research Focus Area

Our Women's Health In Sport and Exercise (WHISE) team

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All kinds of clever

@kaymcrossley

@Knee_Howells

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http://semrc.blogs.latrobe.edu.au/

@LaTrobeSEM

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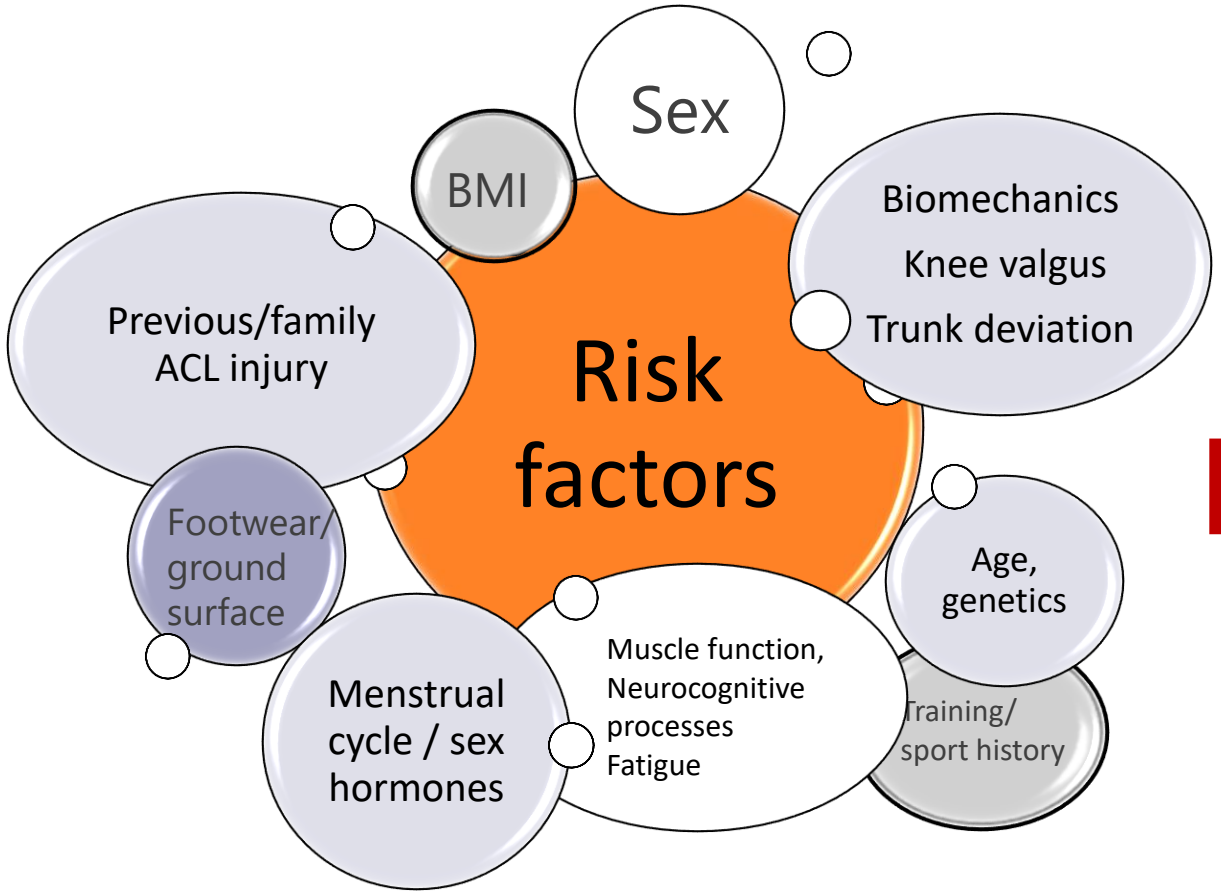
What are the risk factors?



Highly complex interaction

Low number of high quality prospective studies

Risk factors with highest quality evidence = sex, previous/family history

Renstrom (2008); Smith (2012); Prodromos (2007)

Is co-creation the key??

Blog | British Journal of Sports Medicine

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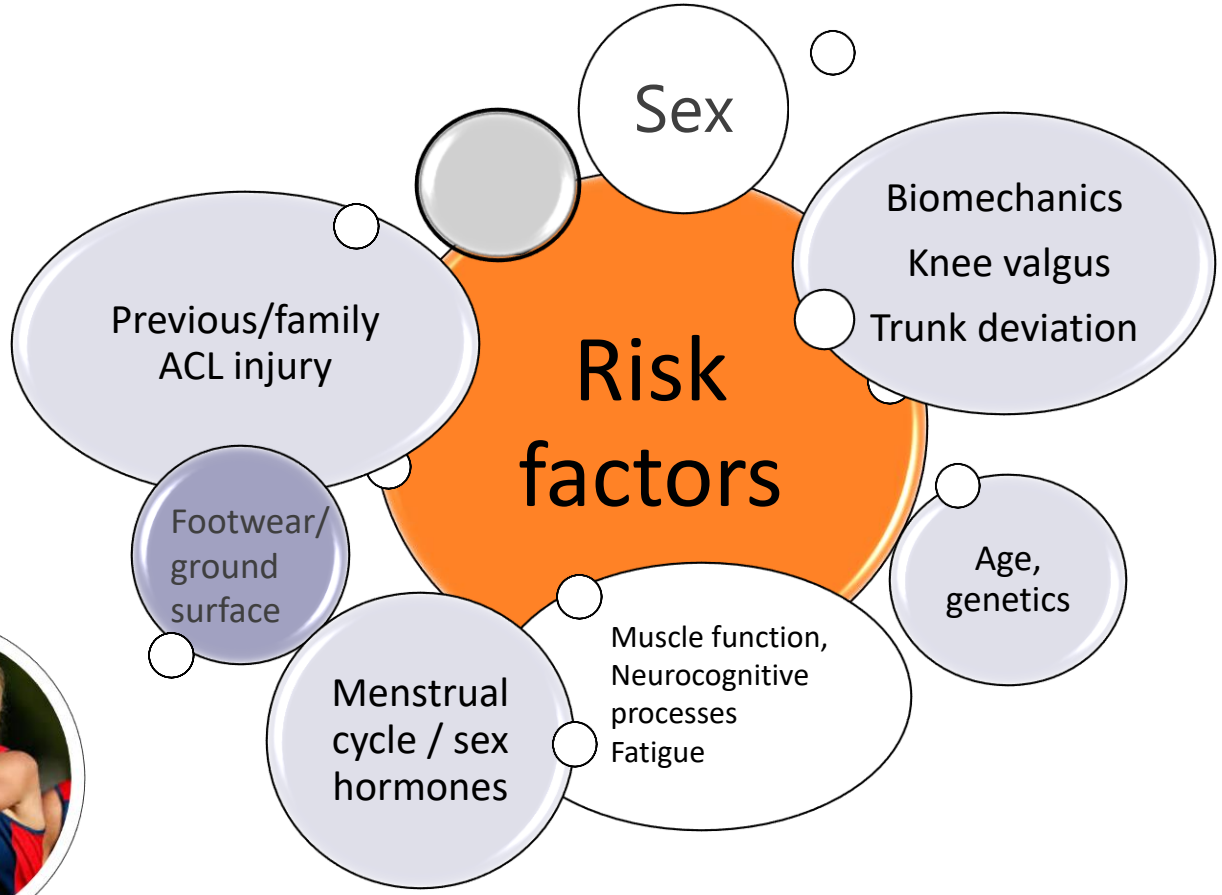
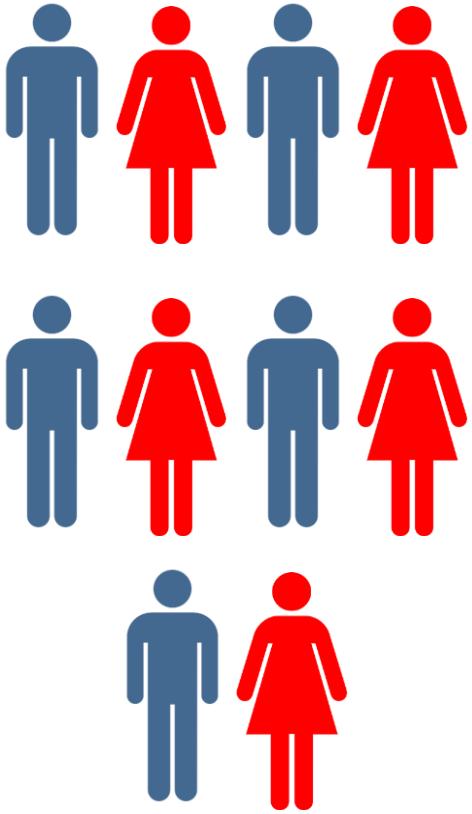
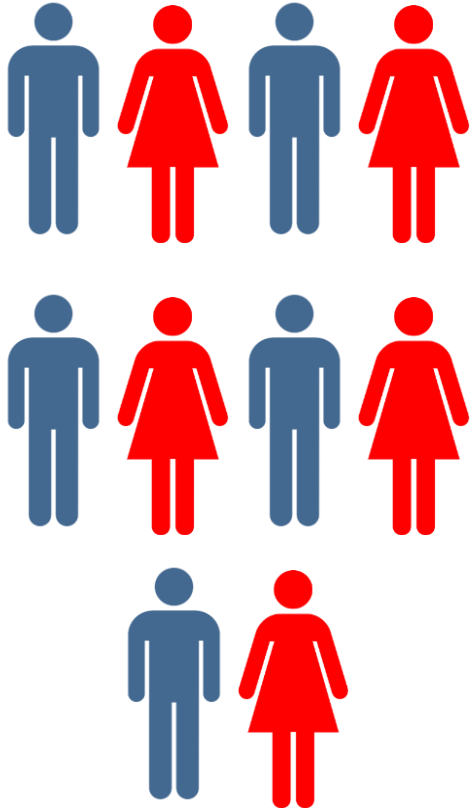


The risk of injury can be reduced

Intervention Group



Control Group



The risk of injury can be reduced

Intervention Group

2 injured

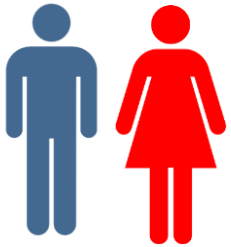
10 people

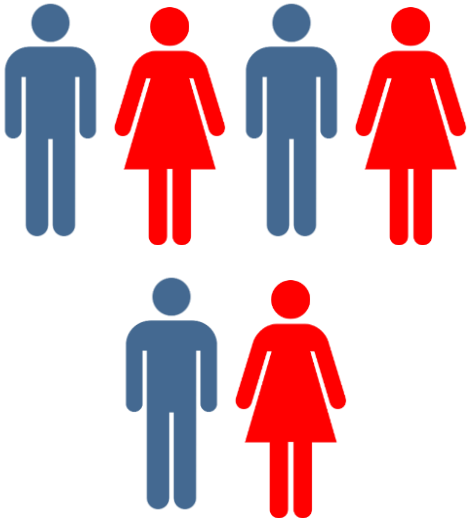
= 67% reduction of injury in the intervention group

Control Group

6 injured

10 people





Meta-Analysis of Meta-Analyses of Anterior Cruciate Ligament Injury Reduction Training Programs

Kate E. Webster,[1] Timothy E. Hewett[2,3,4,5]

[1]School of Allied Health, La Trobe University, Victoria, Australia, [2]Mayo Clinic Biomechanics Laboratories, Department of Orthopedic Surgery, Mayo Clinic, Rochester, Minnesota, [3]Department of Physiology & Biomedical Engineering, Mayo Clinic, Rochester, Minnesota, [4]Mayo Clinic Sports Medicine Center, Mayo Clinic, Rochester, Minnesota, [5]Department of Physical Medicine & Rehabilitation, Mayo Clinic, Rochester, Minnesota

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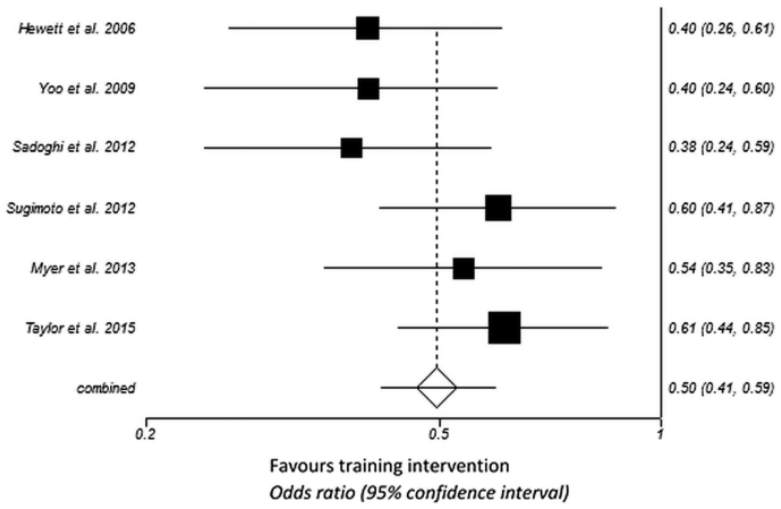
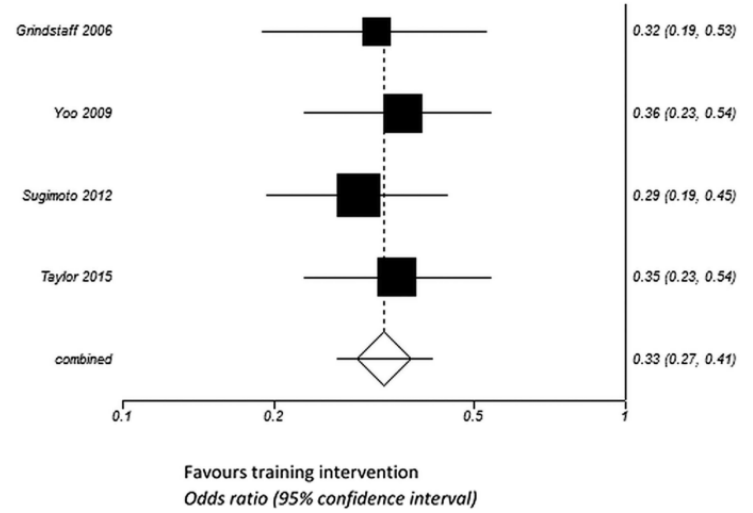
All participants, 50% reduction



Women, 67% reduction

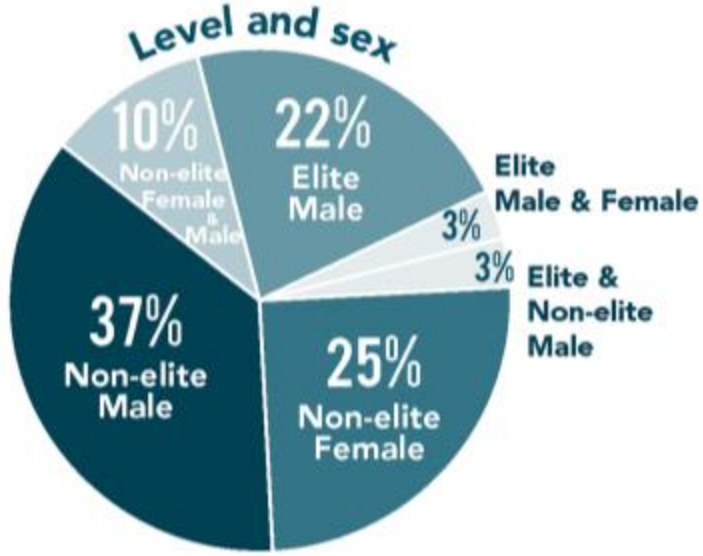


Journal of Orthopaedic Research, in press

What about **elite** women's football?

Limited research in elite female football

- Priority, due to high exposure & number of injuries
- Large scale high quality RCT's in amateur levels suggest ~45% reduction



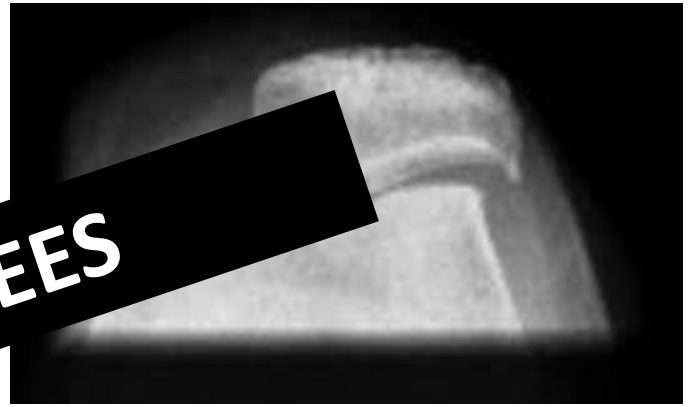
Bricca et al., BJSM (2018)

Are current Injury Risk Reduction (IRR) programs appropriate for AFLW players?

"The ACL is the most talked about 3cm in the body,
and rivals the heart, brain and genitals as the most interesting."
Dr John Bartlett, pioneer of ACL reconstruction surgery in Australia

Impact on athlete

ACL injury → +1 year → +5 years → +10 years



Typically adolescents

~30-40 years old

YOUNG ADULTS WITH OLD KNEES

50-90% Radiographic Osteoarthritis

Lohmander et al., (2007); Oiestad et al., (2010 & 2011); Filbay et al., (2014);

WHAT IS AN ACL?

Australian Football ACL Injury Mechanisms

Non-contact

- Landing