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## Goals

The aim of this resource is to give coaches, athletes, PE teachers and parents the tools to integrate safe Strength & Conditioning (S&C) practices within sessions. This resource will specifically address the *Discover, Learn and Play* stages of the Athlete Development Model (ADM) which has been created by World Lacrosse. In Hong Kong, these stages are likely to involve primary, secondary and university students but this is not always the case. There are QR codes attached to each section which will take you to a video library with instructional videos.

## Introduction

The Hong Kong Lacrosse Association (HKLA) has the mission to develop lacrosse across the local community, making lacrosse inclusive of all genders and ages. We believe that participation in team sports has a positive impact on the physical, cognitive and social aspects of life. This is especially true for children and adolescents in Hong Kong where these opportunities may be somewhat limited.

Lacrosse has been developing rapidly in Hong Kong for the past few years. It is still a relatively new sport for the public that students are not familiar with. It has the potential to benefit students with lifelong skills such as team work, communication and perseverance

Lacrosse is an invasive game which has similar concepts to basketball, football and hockey. The skills learnt are transferrable and applicable across different invasive games. Invasive games have the following principles; (Webb and Pearson, 2004)

- Achieve / maintain possession of the ball
- Create space to move in the other team's half
- Score more points than your opponent

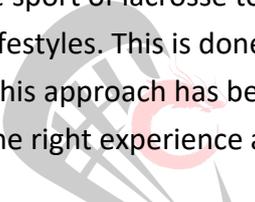
## HKLA Vision

***It is the vision of the Hong Kong Lacrosse Association to establish lacrosse as a major sport in Hong Kong.***

In order to achieve our vision, we must have an ideological framework to describe the pathway we want to guide all participants on. This pathway must be experience, age and athlete appropriate.

World Lacrosse has developed an Athlete Development Model (ADM) which is based on a larger body of work around Long-Term Athlete Development (LTAD). LTAD was originally designed as a High-Performance Model whose goal was to get athletes on to the podium. However, a by-product of this is a practical and applied model which national governing bodies (NGB) can use to help athletes discover a game as children and retain them through their lives.

It is the goal of the ADM to utilise the sport of lacrosse to positively influence mental and physical health and promote active lifestyles. This is done through providing programmes that meet the needs of the participants. This approach has been labelled as being 'athlete centred' but can be simplified to providing "The right experience at the right time".



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## Philosophy of the ADM

The ADM is built upon 5 key tenets.

**Players First-** Every athlete is provided an experience that meets them where they are developmentally.

**Seriously Fun-** Lacrosse should be fun at all levels and within all participation models.



**Coach the Coaches-** Trained coaches are more successful at retaining players than coaches who are untrained. Coaches should have a commitment to lifelong learning through both formal qualifications and courses as well as informal growth throughout their lives.

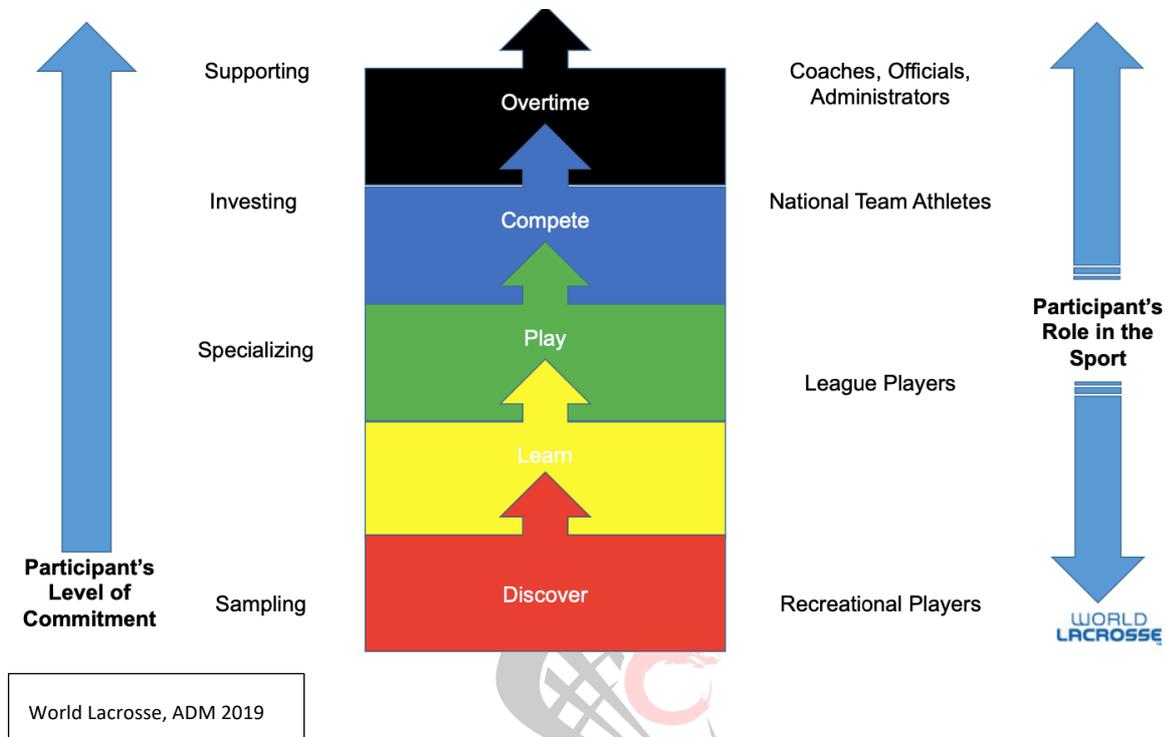
**Play and stay-** The lacrosse experience is focused on participation and retention as much as it is on skill development. There are multiple opportunities to enjoy the game regardless of the individual's ability. Provide opportunities to participate in a lifetime love of sport.

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**Get Moving-** Participation in lacrosse, combined with the deliberate incorporation of physical literacy training inspires a greater desire to be physically active for life.

## Stages of the ADM

The ADM is broken down into 5 stages of participation.



Stage	Years of participation	HKLA Programmes
Discover	0-2	Project Crosse (Little League Lacrosse, Lacrosse 6's, Youth and Adult Beginners' Courses, Development Academy)
Learn	2-3	Development Academy and High Performance Programme
Play	3-7	High Performance Programme and Representative Teams
Compete	7+	Representative Teams
Overtime	Any	Instructor Course, Coaching Course Level One and Two, Officiating Level One and Two, Volunteering

**Discover-** The opportunity to utilise lacrosse participation to develop and incorporate fundamental movement and physical fitness skills in a fun environment that inspires a love of the sport. Coaches should emphasise enjoyment of the sport and physical activity while blending fundamental lacrosse skills into sessions.

**Learn-** Athletes who are looking to develop the skills necessary for formal competition fall into this category. Fundamental skills are taught and tactical skills are introduced while still maintaining a fun and engaging environment.

**Play-** Athletes are refining technical and tactical skills to prepare for competition. General physical training is introduced where appropriate to begin building the foundations for health and performance.

**Compete-** Athletes are ready to train to maximise their physical and mental tools for the demands of elite play. Structured, specialised and individualised strength and conditioning programmes are required to help support the athlete. Sports science support through regular fitness testing, load monitoring and harmonization between the interdisciplinary team are essential.

**Overtime-** Once the playing days are over, the athlete transitions to a different role such as Coach, Official, Admin staff or Volunteer.

## Strength and Conditioning and its role in the ADM

Strength and Conditioning (S&C) is not a new phenomenon. Chinese texts dating back as early as 3600BC reference daily exercise and during the Chou Dynasty, potential soldiers had to pass weightlifting tests before being allowed to enter the armed forces. In recent years, S&C has come to the forefront of major sports. The goals of any S&C programme is to;

- A) Reduce the risk of injury
- B) Increase the physical capacities of athletes in a specific way which allows them to perform their sport better

Injuries are multi-factorial and will never be completely eradicated. They may even increase as the boundaries of what the human body can do are ever changing. This is accompanied by changes in sports rules to make them more viewer friendly and the development of technology which allows athletes to go further and faster. There is also a greater level of competitiveness caused by financial reward. If the risk of injury is reduced, an athlete will spend more time on the field of play which will theoretically improve their ability to perform in competitive situations.

Physical performance capacities that are related to lacrosse performance can be improved at any stage of the ADM. The physical capacities below can all be improved through athlete appropriate training. This training can be safe, fun and integrated in a lacrosse specific session.

## Physical Capacities which Contribute to Lacrosse Performance



## Discover

Participants at this stage have 0-2 years of experience. As previously mentioned, the main goal for these athletes is to inspire a love of lacrosse and physical activity. This must be considered at every stage of planning as S&C is often viewed as very structured and rigid. All training for this group should be informal and unstructured. This often takes coaches out of their comfort zones as it is challenging to manage a group and maintain some level of control.

Physical Quality	Training Method	QR Code
Fundamental Movement Skills (FMS)	Animal crawls, exploration, free play which encourages proprioception	
Speed and Agility	Free play, obstacle courses and games	

## Why FMS?

Good FMS are associated with health, wellbeing and high-level sports performance. These movement skills are developed from childhood and become integrated in proficient movements which make up sporting movements. Therefore, all sport specific movement patterns can be seen as an extension of good fundamental movement skills and this justifies their inclusion in all levels of physical development programs. The prominence of these skills at any given practice are specific to the age group and training age of the players e.g. FMS will make up the majority of a session at the *discover* stage but may only be a part of the warm up at the *compete* stage.

FMS can be split into 4 categories: Movement, Manipulation, Stabilisation and Locomotion.

Movement	Manipulation	Stabilisation	Locomotion
Squat	Throw	Balance	Run
Lunge	Catch	Co-ordination	Jump
Push/Pull	Kick	Posture	Skip
Hinge	Strike	Core and Joint Stability	
Rotate			

It is important that, at the appropriate time, motor skills are challenged within all:

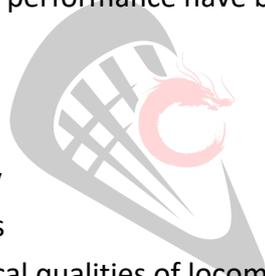
1. Directions
2. Speeds

### **Why Speed and Agility?**

Speed is the ability to move directly to a set point as quickly as possible. Absolute speed is likely to be a key indicator of performance and accounts for differences in playing levels. Although speed training is multi-faceted, this portion specifically refers to pitch based training. Speed is the number one sought after quality in elite sport. It is often a differentiator between elite and sub-elite players and can be the difference between winning and losing. Speed is, to an extent, genetically determined. The fastest children are often the fastest adults. However, speed is highly trainable and everyone can increase their current levels of speed.

The trainable determinants of speed performance have been identified as:

- Neuromuscular skill
- Coordination
- Postural control and stability
- Strength and power qualities
- Mechanical and morphological qualities of locomotor muscles
- Stretch-shortening cycle

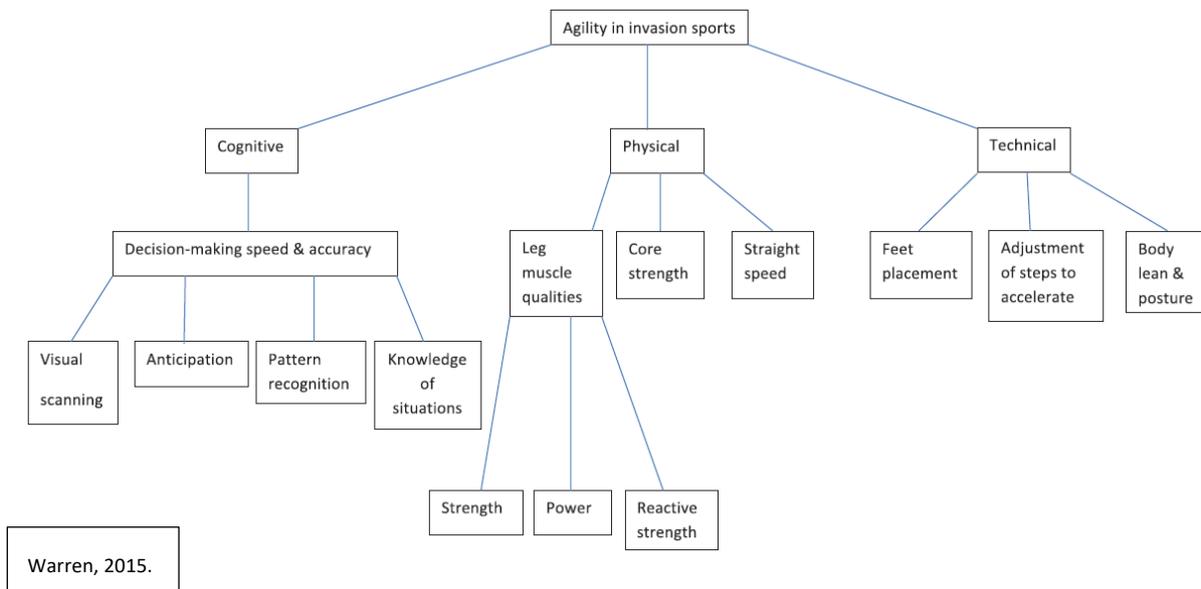


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## Agility

Agility is defined as a rapid whole-body movement in response to an external stimulus. The perception of an external stimulus or situation causes a decision to be made and an action to take place. This is referred to as perception-action coupling. Perception-action coupling is inseparable from agility; therefore, agility should be trained in reactive environments which require decision making. Agility in a lacrosse context can be any movement which involves a change of direction and could specifically involve dodging which is a crucial element of lacrosse. There are likely changes of directions every 1-4 seconds which amount to hundreds and possibly thousands per match played.

The illustration below from Young et al, 2015 shows the multi-faceted and complex nature of agility. This skill is determined by physical qualities but is also majorly influenced by the ability to read and react to varying sporting situations.



### Discover Session Planning

Session planning at the Discover stage is simple. Allocate 15 minutes at the start of your session for S&C activities. A station-based system could work well with this group, this allows athletes to choose what they would like to do which gives them ownership over the activity and makes them more likely to be engaged. This prevents the athlete becoming bored which is common in this age group.

### Session Outline

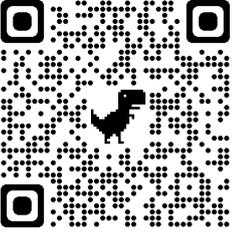
Time	Content
0-15	1-2 station FMS, 1-2 station speed and agility games
15-60	Lacrosse based activities

FMS Games	Games/Drills
Movement	The hunter and the hunted Samurai Stick Stick tug of war Bear crawls Wheelbarrow crawls Football rotational throws
Manipulate	Tennis ball throws Single and Double hand catch Football/Rugby ball kick for distance and targets Football Viking throws and slams
Stabilisation	Single leg balance and variations Floor is lava

Speed and Agility games	Games/Drills
Speed	Races- Linear and curvilinear Team relays Obstacle courses with running sections
Agility	Tag Ball drop Red Light Green Light Dodgeball Treasure Grab Swiss ball dodge Cone toss Cone destruction

## Learn

Participants at this stage have 2-3 years of experience. All training should still be fun but it is possible to add more structure at this stage.

Physical Quality	Training Method	QR Code
Fundamental Movement Skills (FMS)	Animal crawls, exploration, free play which encourages proprioception	
Speed and Agility	Free play, obstacle courses and games	
Strength	Bodyweight training	
Power	Jumps and rotational throws	

### **Why Strength?**

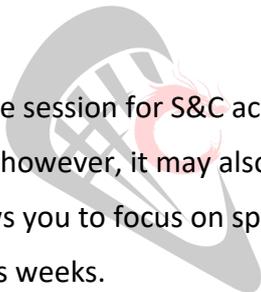
Strength is the ability to produce very high levels of force with no time constraint. High levels of strength are associated with jump height, acceleration, speed, repeat sprint ability and the reduced risk of injuries. In adolescent and female populations, strength gains are primarily due to neural adaptations. In adult male populations, muscular hypertrophy is also contributor to strength. Strength training has also been shown to reduce overuse injuries by up to 50%. This makes it a highly effective and safe way to keep athletes healthy.

### **Why Power training?**

Power is the ability to produce moderate to high levels of force in a very short period of time (sub 0.3s). Good levels of power of both the upper and lower body are required to be a successful lacrosse player. Power is trainable in all populations; however different modalities of power training have different time costs and risks associated.

### **Learn Session Planning**

Allocate 20 minutes at the start of the session for S&C activities. A station-based system would still be useful with this group; however, it may also be a good idea to shift the focus of the session every 4 weeks. This allows you to focus on specific physical qualities and athletes can make progressions from previous weeks.



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## Session Outline

Time	Content
0-5	1 station FMS
5-10	Speed and agility game
10-15	Power training
15-20	Strength training
20-60	Lacrosse based activities

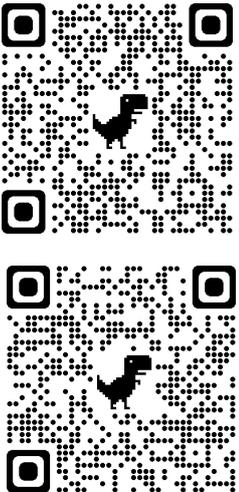
Strength	Exercises
Lower body	Crab Wrestling Duck walks Partner pushes and variations Back pack squat to overhead
Upper Body	Bear crawl shoulder touch Tug of war Climbing Hanging Handstands

Power	Exercises
Lower body	Jump for height Jump for distance Viking throw
Upper Body	Ball slam Ball chest pass Supine wrestle Partner Push
Rotation	Half kneeling ball throw Closed stance ball throw Open stance ball throw

## Play

Participants at this stage have 3-7 years of experience. They are preparing for the rigorous demands of competition and therefore training should reflect these demands. Physical training can become more formalised and can involve gym-based strength and power training. Currently, in Hong Kong, players at this stage are likely to be over the age of 18.

Physical Quality	Training Method	QR Code
Fundamental Movement Skills (FMS)	Animal crawls, exploration, free play which encourages proprioception	
Speed and Agility	Free play, obstacle courses and games  香港棍網球總會 HONG KONG LACROSSE ASSOCIATION	

Strength	Bodyweight training and resistance training	
Power	 香港棍網球總會 HONG KONG LACROSSE ASSOCIATION	
Energy Systems Development	Running or games at different intensities and work to rest ratio	
Availability (Injury Prevention/Reduction)	Targets commonly injured joints and movement patterns	

## Why Energy Systems Development?

Although having good 'endurance' is seemingly important for Lacrosse performance, at no point will it be the main focus of the S&C program. Energy systems will be thoroughly developed through intense lacrosse training and match play and will replicate the demands of the game far better than any conditioning work could. However, this natural development can be supplemented with specific types of training.

The three main energy systems are:

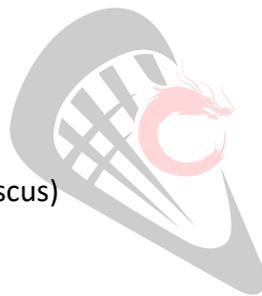
1. Phosphagen (ATP-PC): For explosive events that last for less than 10s. We improve this system through speed and agility training.
2. Glycolytic: We base our prescription mainly on Dan Baker's work "Recent trends in high-intensity aerobic training for field sports". This study identified that time spent above 100% max aerobic speed (MAS) is the most important factor in improving performance in both continuous and intermittent running-based tests. Specifically, 120% MAS seems to be the most effective at improving performance. Generally, 1:1 work: rest periods are utilised in either 15:15, 20:20 or 30:30 fashion. Sets of 4 minutes have worked the best for our athletes with a rest time between sets of half the length of the set. We use an inverse relationship between the % of MAS and the length of both the rep and the set. To find out and calculate the MAS of the athletes, a time trial that is between five- and six-minutes duration of any running based test can be done.
3. Aerobic (Oxidative): For low intensity events that last more than three minutes. We train this system only through lacrosse practice where it will happen naturally.

## Why Availability?

An available player is one who has no injuries and is fit and healthy. The biggest predictor of sporting performance in a variety of sports has been shown to be availability. An available player can take part in every gym and field session. They can adapt to the stimuli they encounter in these sessions and can translate these positive adaptations into successful gameplay. A player who is successful in match situations is more likely to be selected again. If that player stays available, they will continue to benefit from training and be even more successful in game play. There is no one way to ensure a player is always available for training and matches. However, we must value availability over all other qualities and must take this into account when we organise any form of training. It is not advisable to chase the improvement of one quality at the expense of seriously risking a player's availability.

Common lacrosse injuries:

- Ankle sprain
- Hip flexor strain
- Hip adductors strain
- Hamstring strain
- Knee sprain (ACL, MCL, meniscus)
- Low back pain
- Rotator cuff issues
- Concussion
- Wrist sprain or fracture



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Ideally, we want to target joints or movement patterns that are involved in these common injuries which are, ankle, knee, hip, core and shoulder.

## Play Field Session Planning

Allocate 30 minutes at the start of the session for S&C activities. This work is adapted from the ALTIS Foundation Course Resources.

### Session Outline

Time (mins)	Content
0-10	Dynamic warm up
10-15	Injury prevention (dynamic stability)
15-30	Speed complex/ Agility drills/ MAS-based drills
30-90	Lacrosse based activities

Dynamic Stability
Hop and hold (linear/multi-direction) SL landing controlled SL landing (with shoulder bump)

**Speed complex:** By using two to three exercises in a sequential fashion, it is possible for skills or physical abilities to be taught and learnt more successfully than in a linear fashion.

### Starting Abilities

Exercise name	Athlete focus	Coach focus
Rollover/w throw	Fall and push hard	Projection angles of ~45° and negative shin angles
Walk in/Drop in/Skip in	Push down and back on first step	
Three-point start		
Post up drill	Projection angle	Athlete long body axis in a straight line
Resisted start	Push down and back on first step	Projection angles of ~45° and negative shin angles
Start from ANY position	Depends on start position	

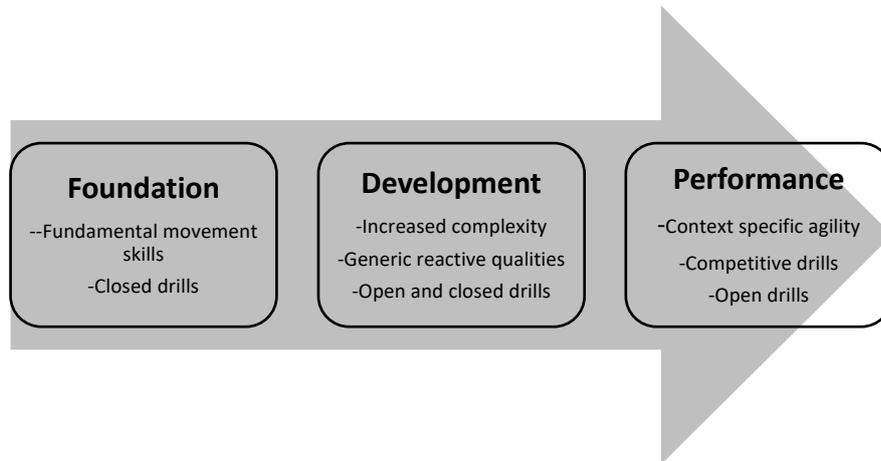
## Acceleration

Exercise name	Athlete focus	Coach focus
Wall drill march/run	Maintain body angle	Projection angles of ~45° and negative shin angles
Post up drill	Keep body in one line	
Resisted marching	Push hard!	
Resisted acceleration	Push hard!	
Skips for distance	As far as they can go on each stride	Hips projecting forwards on each step
Bounds for distance		
Accelerations	Be fast. Feel the body come more upright on each step.	Projection angles of ~45° and negative shin angles

## Max Velocity

Exercise name	Athlete focus	Coach focus
March/Run in place	Foot strike down	Upright posture and foot strike straight down
Skip for height	Max air time	
Flying starts	Achieve max speed before 'start'	Upright posture and foot strike straight down (aka good frontside mech)
Sprint-float-sprint	Full relaxation in float and maintain into second sprint	
Sprints	Upright posture and strike down	Rhythm and co-ordination

## Agility



Skill	Movement	Pattern
<b>Acceleration (from static positions)</b>	Forwards or diagonal	Jab step
	To the side	Cross step or shuffle
	Backwards or diagonal	Drop step or back pedal
<b>Change of Direction (in motion)</b>	Deceleration	Choppy steps and drop
	Curvilinear	Curved run
	Diagonal	Cut step
	Lateral	Shuffle or cross step

## Energy Systems Training

Type	Intensity	Work: Rest (minutes per set)
Interval running	~120% MAS	15:15, 20:20 or 30:30 (4mins set)
Small-sided games (e.g. 3v3, 4v4)	High intensity	4mins game, 2mins rest between games
Lacrosse drills (e.g. groundball, clearing riding)	High intensity	15:15, 20:20 or 30:30 (4mins set)

## Play Gym Session Planning

Athletes should already be familiar with bodyweight upper and lower body strength exercises at this stage and can start to build more strength and power through resistance training in a gym setting.

## Weekly Programming Structure

Adapted from Boyle, M (2016). *New Functional Training for Sports*. 2<sup>nd</sup> edition, Human Kinetics.

Day 1	Day 2	Day 3
Explosive lower body Explosive rotation	Explosive lower body Explosive rotation Trunk (anti-extension)	Explosive lower body Explosive rotation Trunk (anti-extension)
Lower body strength (Knee dominant) Lower body strength (Hip dominant) Trunk (anti-extension)	Lower body strength (Hip dominant) Lower body strength (Knee dominant) Mobility exercise	Lower body strength (Hip dominant) Lower body strength (Knee dominant) Mobility exercise
Upper push Upper pull (vertical) Trunk (anti-rotation)	Upper push Upper pull (horizontal) Mobility exercise	Upper push Upper pull (horizontal) Mobility exercise
Injury prevention package of choice	Injury prevention package of choice	Injury prevention package of choice

\*Make sure to change programme every 4-6 weeks to allow new stimulus to the body.

\*\*Choose an injury prevention package appropriate to the players injury history.

Exercise Category	Sets and rep recommendations	Rest time
Explosive Lower Body Explosive Rotation	2-3 sets of 3-5 reps	3 minutes
Lower body strength (Knee dominant) Lower body strength (Hip dominant) Upper push Upper pull (vertical)	2-5 sets of 5-10 reps	2-3 minutes
Trunk (anti-rotation) Trunk (anti-extension)	2-3 sets of 6-12 reps	30-60s
Injury prevention package	3 rounds	30-60s

## Injury Prevention Package

Ankle
Foam roll calves Front foot elevated split squats (pause in end position) Single leg balance Front foot elevated split squats (pause in end position) Calf raise- bent leg and straight leg
Knee
Foam roll quads/ hamstring Saddle pose SL squat to box (heel raised/slow eccentric) Glute bridge
Hip/Back
Foam roll glutes and quads Hip flexor stretch Cat/Camel 90/90 Hip rotation Lying thoracic spine rotation
Shoulder
Roll pectorals and latissimus dorsi Banded lat stretch Band pull apart



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