

Preparation for Performance: Scottish Rugby Union Referees



**SPORT &
EXERCISE**



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Executive Summary

Problem: Referee preparation for games in Scotland and across the world is erratic and currently has no specific guidance

Solution: The goal of this report was to carry out a scientific assessment of the **physical**, **mental** and **nutritional** needs of Scottish Rugby Union match officials and synthesise recommendations for training and lifestyle for optimal performance based on relevant literature and best current knowledge

Needs:

Referees cover around 7km per game, requiring all different speeds of running, meaning strong **aerobic fitness** and **anaerobic fitness** are required. Referees cover similar distances and move similarly to soccer players, so in terms of training and injury prevention needs they are similar.

The **5 key mental factors** identified as fundamental for performance in referees: (a) Stress Control, (b) Resilience under pressure, (c) Motivation, (d) Mental Skills and (e) Mental Stamina.

Nutritionally, referees' needs are similar to the general public when not training or refereeing, however, when training or refereeing, caloric output is raised by around 500kcal/day. To optimise training benefits, carbohydrate intake and caloric intake should increase accordingly.

Goal: To guide refereeing performance preparation through scientific literature synthesis

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Recommendations:

- A FIFA 11+ style warmup before training and games will decrease injury risk
- Plyometric, aerobic and resistance exercises in training up to 3 times a week in groups
- Form training groups with regular training times to help maintain participation and drive competition
- Work with coaches, friends and training partners to develop technical skills
- Experience many games and challenging circumstances in rugby, appreciate this as part of the process and adopt a growth mindset to mistakes
- Play brain games, get plenty of sleep and keep calm
- Follow government guidelines for diet when non-training. When training increase CHO by ~500kcal/day
- Most importantly - Make friends! This can be from training groups, societies or online refereeing forums

Incorporating these practices into regular routine for referees prepares them for match readiness excellently, improving the performance of the whole Scottish Rugby refereeing community.

Background

Referees are at the core of every rugby game, leading it to be one of the world's fastest growing and competitive sports with new professional leagues in Japan and USA in just the last few years. It is important then, that referees have the best opportunities and guidance to optimise performance to assist in improving the quality of the game. No rugby union in the world is yet to produce a comprehensive, scientific guide supporting referees and match official departments to prepare for games and achieve best performance. This research project aims to be the first to provide a holistic guide to refereeing preparation for both high performance and casual referees, involving physical, mental and nutritional understanding whilst appreciating the realities of refereeing with formalities, admin, work and necessary technical preparation.

The absolute goal of refereeing is to facilitate a game of rugby as fairly as possible. In order to do this, correct decision making is necessary. Proximity to events is correlated with successful decisions for match officials^[1] so being able to do this well is vital, meaning a referee must run an average of 6.8km per game^[2]. The ball moves quickly and so do players therefore a referee must be capable of similar speed to remain close to events. To be able to do this, a referee must physically train and have sufficient fuel to facilitate these movements. Optimal physical preparation will lead to optimal ability to remain close to events and therefore optimal decision making.

Decision making is a cognitive process. To perform cognitive processes effectively, the individual's mental state is important. Their concentration is also important for achieving this and multiple mental factors affect concentration. Low blood sugar also affects concentration. Effective mental preparation will improve mental state and therefore improve decision making.

Rugby matches last a long time. Maintaining concentration for 98 minutes in real time^[2] with very little break is difficult. It has been identified that referee decision making worsens within the second half^[1]. This could be to do with multiple factors including lowered concentration and low fitness. Both of these can be improved with effective mental, physical and nutritional preparation.

The information on these has not yet been organised for a rugby refereeing specific context. The report therefore has the task of outlining effective practice for referees' physical, mental and nutritional preparation for performance.



The average rugby game lasts 98 minutes with referees having to concentrate the entire time^[2]



Proximity to events is related to decision making success^[1]



Referees cover average distances of 6.8km/game^[2]



Late game decision making by referees decreases in quality^[1]



Referees must keep up with players reaching speeds over 37km/hr^[3]



Maintaining focus throughout the game is a very difficult task^[4]



Fuel for speed, endurance and thinking is vital for maintaining refereeing ability



What makes referees capable of all this?

PREPARATION



Physical Needs

Rugby referees require agility, cardiovascular, respiratory, muscular endurance and high peak velocity.

Closeness to any incident needs to be maintained throughout the game and therefore physical capability to achieve this is necessary. To determine what physical capabilities are required, breakdown of the activities of current elite and high quality referees during a game can show what is currently done to achieve this.

The breakdown of different running speeds is similar to a central defending soccer player. Elite referees sprint for an average of 328.1 ± 230.3 m per game compared to an elite central defender's 247 ± 152 m^{[5][6]}. Elite referees have reported distances of over 10km in some games. Although professional soccer players run around 3km more per game, the capability to perform to this level would allow referees to maintain performance throughout the more physically testing games, such as the reported 10km games.

Table 1 Movement patterns in soccer		
Type	Aim	Movement pattern
Initiation	Start to front	Acceleration pattern
	Start to the side	Hip turn and drive
	Start to the rear	Drop-step
	Change direction	Cut step / plant step
Transition	Static wait	Athletic position
	Jockeying	Moving athletic position
	Moving to the side	Side-shuffle
	Moving to the rear	Back-pedal
	Moving to the front/curved	Efficient running action
	Tracking the attacker diagonally	Cross-step run, body facing target
	Deceleration	Chop-steps to athletic position
	Controlled movement to front	Athletic position chop-steps/ adjustment steps
Actualization	Acceleration	Acceleration movement patterns
	Move to top speed	Kick from a rolling start

Table 2 Movement patterns in rugby refereeing		
Type	Aim	Movement pattern
Initiation	Start to front	Acceleration pattern
	Start to the side	Hip turn and drive
	Start to the rear	Drop-step
	Change direction	Cut step / plant step
	Start squat	Foot turn and back straight
Transition	Static wait	Ready position
	Moving to the side	Side-shuffle
	Moving to the rear	Back-pedal
	Moving to the front/curved	Efficient running action
	Tracking the ball/play diagonally	Cross step run, eyes facing target
	Deceleration	Chop-steps to an athletic position
	Controlled movement to front	Athletic position – adjustment steps
Actualisation	Squatting to view play	Squatting movement pattern
	Acceleration	Acceleration movement patterns
	Move to top speed	Kick from rolling start

Comparison of movement types for soccer and rugby refereeing



Table 1 Soccer v Refereeing		
Physical Need	Soccer	Refereeing
Sprints (n)	12.0*	12.5**
Low speed (%)	42.4***	52.4**
Jogging (%)	36.3***	35.2**
Running (%)	14.5***	12.4**
Total distance(km)	10.2***	6.8**

*Andrzejewski et al., 2013[5] **Bester et al., 2019[2] ***Mallo et al., 2015[6]

To identify training needs, the appropriate muscles must be trained and cardiometabolic needs must be met. A helpful guide of movements involved in soccer^[7] has been adapted for refereeing so that movement specific training and injury prevention exercises can be recommended to referees. It is clear when viewing both these tables that movements for referees and soccer players are largely similar and so training and injury prevention needs for both groups are expected to be similar as well.

What this table shows in terms of needs is that there are a lot of agile movements required within refereeing such as changing direction and accelerating, so training muscles for agility is key.

1. The high degree of jogging and high speed running in refereeing cause referees to spend 53% of the time above 80% of maximal heart rate^[2]. This indicates that refereeing is a strenuous cardiovascular task. Improved cardiovascular fitness is likely to assist in reduction of the elevated heart rate between high intensity bouts.
2. Significant amounts of jogging and significant amounts of sprinting indicate that referees require high levels of aerobic and anaerobic fitness
3. Fatigue contributes to decreased decision making accuracy in referees between first half to second half^[1]. Cardio-respiratory endurance is likely to reduce fatigue.



Referees at the 2019 World Cup accelerated and decelerated hard over **35 times per match**^[8]. This comes with **significant injury risk**. Effective **injury prevention** strategies could potentially save someone's World Cup under this circumstance.

Referees are required to keep up with players travelling at speeds up to **37km/h**^[3]. They are also required to make an average of **12 high speed accelerations** per game^[2]. This means training to improve their **acceleration ability** and **maximum speed** would help them stay close to the action and improve performance.

Therefore the key physical preparation needs for a referee are:

- Cardiovascular, respiratory and muscular endurance
- Ability to change speed and direction and operate at all different speeds
- Fast sprinting >30km/hr
- Injury prevention





Mental Needs

Rugby referees require stress control, resistance to choking, high motivation, mental skills and mental endurance.

Given that the task is to make correct decisions to make a rugby game fair, alongside many other technical challenges facing referees, there is an immense toll on referees mentally. This can come from cognition during the game, rate of decision making, stress control or long-term emotional management.

When asked to define key factors impacting refereeing performance, rugby referees overwhelmingly voted for mental skills with the **top 3** being **decision making**, **reading the game** and **communication**^[9]. This shows that referees appreciate that their job is an extremely **mentally oriented skill**, meaning preparation improving mental factors are especially important. What allows referees to execute these mental skills is a complicated interaction of physical, mental and nutritional preparation.

There are **5 key mental factors** in sport that have been identified as affecting performance^[10].

Table 3 Mental Factors Impacting Performance		
	Key Factor	Meaning
(a)	Stress Control	the response associated with the demands of training-competition and potentially stressful situations
(b)	Influence of Performance Evaluation	to the response in situations wherein subjects assess their own performance or think significant individuals are examining them
(c)	Motivation	the continuous drive to improve oneself, the effort-reward ratio, and recognition from others
(d)	Mental Skills	the ability to self-assess and regulate one's activation level, visualization, focus, control of cognitive dysfunctions, goal setting, and objectively assessing performance
(e)	Team Cohesion	the integration into the sports group, including interpersonal relationships between team members, level of satisfaction with the team, and individualistic attitude compared to the group.

4 mentally oriented factors previously identified as important in referee match preparation are (a) decision-making, (b) game management, (c) the referee crew, and (d) referee evaluation^[11].

Influence of performance evaluation (IPE) can mostly be characterised as **resistance to choking**. The important difference is that there can be a performance benefit from these pressures as well as the detriment associated with choking. This means that IPE exists on a spectrum of performance. Choking can occur due to multiple factors such as **distraction**, **anxiety** or **incorrect focus**. Choking can be an extremely traumatic event for a performer^[12]. It is for this reason that it is vital to train resistance to it so that the detrimental effects can be limited.

When asked to identify key performance characteristics of a rugby referee, referees ranked all top 6 skills as **cognitive** skills^[9]. This means referees must do their homework. Learning skills such as **laws**, complex **decision making** and sports specific **game management** are key for developing performance. These are all mental skills in that they require control, focus and objective assessment at all points.

One important need to consider when developing mental skills is the greater **motivation** required to train^[13]. This means that preparation to improve motivation is likely **the most important** to develop. High motivation is also likely to improve referee retention. Improved motivation improves: ability to train, reduces stress and increases drive to improve^[14].

CHOKING

Is caused by:



Core Refereeing Skills



MOTIVATION



Refereeing is a long, intense mental task with only a short break at half time, largely similar to the concentration required during a surgery, therefore a separate factor specific to this is important. **Mental endurance**. This is the ability to maintain all other mental factors through the **length of the game** without breaks. Mental endurance can improve resistance to decision fatigue, a leading cause of incorrect decisions in those who are required to make hundreds of decisions in a short space of time. It can also help maintain concentration for the required time period and potentially improve late game communication.

Team cohesion and 'the referee crew' are relevant for **high performance** match officials operating as **teams of 3**. Training and bonding as a group can support improved communication and the decision making process. Most referees work alone making team cohesion a less important factor.

Therefore the 5 key mental preparation needs for referees are:

- stress control
- resistance to choking
- high motivation
- mental skills
- mental endurance



Nutritional Needs

Rugby referees require normal dietary intake when non-training and increased energy intake when training or refereeing.

Nutritional needs are based on energy requirements and related loads required for performance.

Scottish Rugby referees are mostly amateur so massively vary in dietary requirements while they are not training or refereeing. It is therefore unreasonable to make specific nutritional recommendations beyond generic health guidelines.

For match days and any training that may take place, however, needs can be better addressed.

Macronutrients (RDI – Recommended Daily Intake) (DV – Daily Value)		
Nutrient	RDI	DV
Calories	2000	2000
Fat	N/A	78g
Saturated Fat	N/A	20g
Cholesterol	N/A	300mg
Carbs	130g	300g
Fiber	38g	28g
Sugar	N/A	50g
Protein	56g	50g

Example recommended intake for 70kg adult male^[15]

A **key difficulty** for many match officials is fitting **healthy nutrition** into their **daily routine**. Common issues causing difficulty for referees in incorporating effective nutrition are:



Any nutritional practices for referees would benefit from taking these into account

Correct nutrition for match officials is personal to workload, training load and individual needs^[16].

- Referee training causes increases around 500kcal/hr^[37].
- Matches lead to increases around 750kcal^[37].
- Male referees require around 3000kcal on a game or training day^[17]
- Female referees require around 2500kcal on a game or training day^[17]
- Female referees require increased iron intake^[17]

**Female Athlete Nutrient Needs
(DRI – Daily Recommended Intake)**

Nutrient	% female athletes consuming DRI	DRI for training day
Carbohydrate	93.9	45-65% total calories
Protein	72.7	1.2g/kg/day
Fat	78.8	25-35% total calories
Vitamin D	0	400IU/day
Vitamin E	0	12mg/day
Iron	89.3% presenting with depleted iron levels	7.9mg/day

Female officials will need a slightly altered diet to cater for sex differences^[17]. As the physical needs are similar to males with an identical task to be performed, differences are smaller, but still must be taken into account for nutritional purposes.

Adult female soccer players have been found to require between 47-60kcal/kg^[17]. For a 60kg female referee this would mean an estimated 2520kcal/day would be appropriate without personalised information. This can be hard to estimate and put into practice for an individual without nutritional support, so specific food examples should be developed to aid visualisation.

Example intake for referees based on female soccer players^[16]



Therefore a rugby referee needs a normal amount of dietary intake during the week, allowing for flexibility with work and family commitments, but higher requirements for matches and training days.



Recommendations For Physical Preparation

Rugby referees should incorporate a FIFA11+ style warmup into their pre-match preparation and training. They should also use resistance training, plyometric exercise, agility exercises and HIIT running 2-3 times a week to improve performance.

FIFA11+ warmups significantly reduce injury rates across sports. Resistance training, plyometric exercise, agility exercises and repeated sprints improve peak speed, agility and aerobic capacity. HIIT running will develop relevant muscles and can be used with any of the other exercise types.



A key principle of training is to **adapt** training to activities an individual **enjoys**. This maintains **motivation** and therefore **performance**. Here we will offer a list of potential activities that a referee can do and allow them and their coach to pick similar exercises and vary as they see fit.

The different types of activities involved in refereeing can be broken down into **agility** activities, **acceleration and deceleration** and **peak speed** activities. Most of the agility, acceleration and deceleration activities have mostly aerobic character.

Therefore training that should be recommended must improve one of these needs.



All intense exercise starts with warmups. The first recommendation is to incorporate the **FIFA11+** warmup into referee **pre-match routine**. Multiple studies have shown that this warmup greatly decreases injury rate in footballers^{[18][19]}. This warmup should be recommended by coaches and officials prior to training and pre-match so that a shared mental model of warmup methods occurs, improving uptake and by extension decrease injuries in referees. This would also mean referees can have a **simple** model of a warmup to use **before any session**.

FIFA11+ contains football specific and partner movements however, so some adaptations have been made from this for rugby referees while retaining the physiological benefits in the visual guide available on page 10.

Adapted FIFA11+ For Rugby Referees

Part 1: Running Exercises (8 mins)

Straight Run



40-60m across pitch
(2 sets)

Hip Out



10 each leg
(2 reps)

Hip In



10 each leg
(2 reps)

Circle Sprint



5-10-15m runs with short
circles
(2 reps)

Run & Side Jump



Run to 5m then side
jump (can use post for
resistance)
(2 sets)

Quick Forwards & Backwards Run



5m forwards and back
full speed
(2 sets)

Part 2: Strength – Plyometrics – Balance (10 mins)

Plank



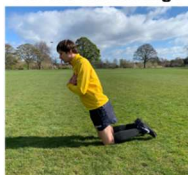
Hold for 20-30 secs
(3 reps)

Side Plank



Hold for 20-30s
(3 reps each side)

Nordic Hamstrings



Slow fall with partner
(3-5 reps of 60s)

Single Leg Hold



Hold for 30s each leg
(2 reps)

Squat on Toes



To 90 degrees for 30s
(2 sets)

Vertical Jump



Every 2 secs for 30s
(2 sets)

Alternate Leg Raise



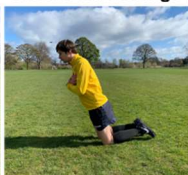
Alternate every 2 secs
for 40-60 secs
(3 reps)

Raise and Lower Hip



Slowly raise and lower
for 20-30s
(3 reps each side)

Nordic Hamstrings



Slow fall with partner
(3-5 reps of 60s)

Ball Toss



Pass rugby ball between
yourself and partner for
30s on each leg
(2 reps)

Walking Lunges



10 times each leg and
jog back to touch line
(2 sets)

Lateral Jump



Alternate leg for 30s
(2 sets)

One Leg Lift



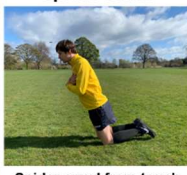
Lift for 20-30 secs then
change and hold for
20-30 secs
(3 reps)

Hold One Leg Raised



Slow lift and lower leg
for 20-30s
(3 reps each side)

Spider Crawl



Spider crawl from touch
to 15m
(3 reps)

Balance Test



Shift weight each
direction on one leg for
30s each leg
(can be with partner)
(2 reps)

Single Leg Squat



As low as possible 10
times each leg
(2 sets)

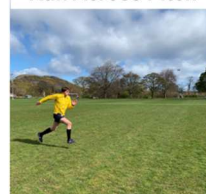
Box Jump



Jump all directions
around centre point for
30s
(2 sets)

Part 3: Running Exercises (2 mins)

Run Across Pitch



Pitch widths at 75-90%
(2 reps)

Bounds



High bounds across the
pitch
(jog back to recover)
(2 reps)

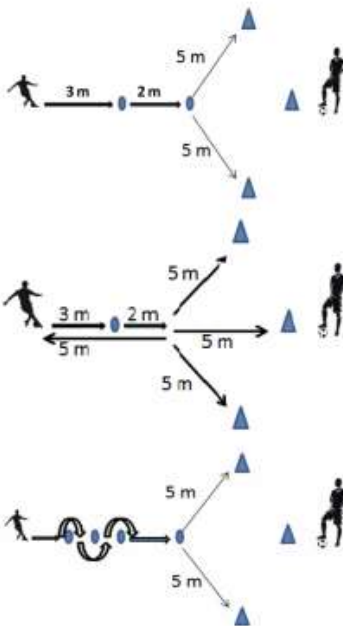
Agility



5 steps at high speed –
90 degree direction
change
(2 sets)

Adapted from FIFA11+ warmup (available with exercise descriptions in Appendix 1)

Rugby referees would benefit from these agility exercises in training:



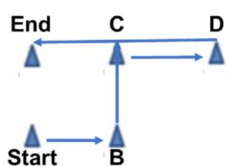
Run towards the 5m line. At 3m, the partner angles shifts the rugby ball to their left or right hand side, the referee shifts their movement at the 5m line to the cone in the respective direction. Hand signals can be used as an alternative where no ball is available.

Same as above but with immediate change of direction when the direction is displayed, also allows no change of direction as an option.

The Referee slaloms through the cones towards the 5m line followed by a change in direction determined by the partner's indication.

Options for agility exercises with a partner^[20]

These must be performed with a partner. Individual alternatives are available for remote individuals or individuals not part of a training group, however, involvement in a training group is likely to greatly improve a referee's development.



The Referee sprints from the start to point B, immediately changing direction and sprinting to point C, changing direction again to point D followed by a 180 degree turn and sprint through to the end.

Option for agility exercise without a partner^[21]

These types of exercise will be fantastic for helping referees transition between phases quickly and effectively, however, refereeing also requires officials to be jogging for long periods of time. This means aerobic running capabilities are of value to rugby referees.






To **train** aerobic capacity, **HIIT** and if possible aerobic threshold training are optimal. A more realistic measurement to use than aerobic threshold is **heart rate**. Many referees already use heart-rate monitors and Fitbits for training, this could be useful in making sure they are training at the right intensity.

HIIT exercise could incorporate **agility exercises** and **speed exercises** already promoted, but in a HIIT format^[22].

One study showed that soccer referees found improvements with long interval training using short (30-second and 1-minute) and long (4- and 8-minute) intervals^[23]. They trained for 3-4 days a week for 12 weeks using exercise intensities above 90% of maximal heart rate. Referees found improvements in **Yo-Yo performance** (+31%) and in **time to exhaustion** (+7%). They also improved **high-intensity running** (+23%) and average **distance from infringements**. Improvements in match activities were reported to be particularly evident during **the second half**. This is extremely promising for **referee specific needs**.

Improving acceleration and deceleration involves a lot of power based training^[24]. Key to this is resistance exercise and strength and conditioning^[24]. The types of exercise that will improve outcome are: strength and power training with weights, plyometric exercise, ballistic exercise and repeated sprints.

The benefits of doing these types of training on both peak speed and acceleration are due to multiple factors:

Benefits of resistance, plyometric, and repeated sprint exercise		
Benefits:		How?
	Neurological Adaptations	Quickened motor unit recruitment and better co-ordination
	Structural Development	Increased tendon elastic potential and muscle cross sectional area
	Improved Technique	Practising sprints improves sprint technique and stride length
	Improved Capacity	Increased VO_{2max} and cardiac output
	Increased Ground Force	Higher ground force means a larger spring through the next step



Given all this information, here is what a typical training week could look like for a referee:

It is important to note that these are example **training timetables** in season. Any referee's training timetable should be **individualised** between them and their **coach** to fit their **goals** and **needs** of their lifestyle. Training programmes should also be **varied** week to week to maintain interest^[26]. These examples aimed to showcase types of exercise appropriate for the groups. It is important to note that low involvement officials would not be expected to be gym members where high performance would, so any strength and conditioning for low involvement referees must be available cheaply. Both examples encourage **training groups** as they have been shown to both improve physiological outcomes^[26] and mental outcomes.

Example Training Week For A High Involvement Referee

Day of week	Mon	Tue	Wed	Thurs	Fri	Sat	Sunday
Training involvement	Running	No Training	Game/Gym	If Wed game then gym If not then Running	No Training	Game day	No Training
(Location)	(Local park)		(Murrayfield Gym/local gym)			Warm up: FIFA11+ [20mins]	
[time taken]	Warm up: FIFA11+ [20mins] Repeated sprints: 5x30s w/ 15s rest @90%HRmax [6min] 2x4 min run @ 90%HRmax w/ 2 min rest + 1x 8 min jog w/ 4 min rest [24 min] 3x 5 cone agility w/ rest until the rest of the training group have gone through [10 min] [Whole session [1hr 30]		Warm up: FIFA11+ [20mins] Rack pull 70%1RM 5x3 ½ back squat 90%1RM 3x3 Straight legged deadlift 75%1rm 3x8 Bench press 80%1RM 3x6 Jump and stick 1 leg and 2 leg 3x5 each Box jump 1 leg and 2 leg 3x5 each [Approx. 1hr]	Warm up: FIFA11+ [20mins] Repeated sprints: 5x30s w/ 15s rest @90%HRmax [6min] 2x4 min jog w/ 2 min rest + 1x 8 min jog w/ 4 min rest [24 min] 3x 5 cone agility w/ rest until the rest of the training group have gone through [10 min] [Whole session [1hr 30]			

Example Training Week For A Low Involvement Referee

Day of week	Mon	Tue	Wed	Thurs	Fri	Sat	Sunday
Training involvement	No training	Running/plyometrics	No training	Running	No Training	Game day	No Training
(Location)		(Local park)		(Local park)		Warm up: FIFA11+ [20mins]	
		Warm up: FIFA11+ [20mins] Repeated sprints 5x10s with 10s rest 2x4min run w/ 3 min rest +1x8 min run w/ 6 min rest (Can compete w/ training group) Jump and stick 1 leg and 2 legs: 3x5 each Bounds 20m 3x5 Slalom and direction change w/ guide: 5x where rest is time until group have cycled		Warm up: FIFA11+ [20mins] Nordic hamstrings w/ partner 3x10 3x3 min jog w/2 min rest + 1x6 min jog w/ 4 min rest 3x5 3 cone agility w/ partner, rest while partner performing			



Recommendations for Mental Preparation

Rugby referees should:

- *Experience challenging games*
- *Adopt a growth mindset with regards to errors*
- *Make friends and prepare as a training group*
- *Train technical skills with training groups*
- *Relax*
- *Get a good night's sleep*

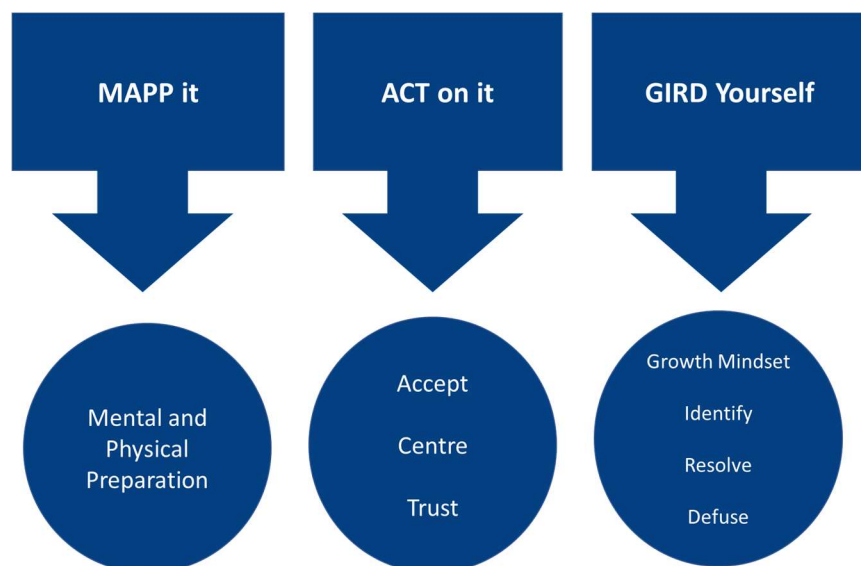
In order to optimally mentally prepare for performance.

Mental training needs identified require significant investment to improve, and it will be unreasonable to suggest they will improve immediately. These improvements are likely to develop gradually, similarly to physiological improvements but are very likely to be noticeable when reviewing a season rather than at any moment.

Resistance to choking:

MAPP (mental and physical preparation) can **reduce risk of choking**^[12]. For an official, this would mean being very prepared with their processes for how they will referee within certain given situations such as a 'flashpoint' red card event. The recommended method to achieve this is to have **rehearsed** simple, effective **routines** and **mental checklists** to use in these situations. Physical preparation and **trust** in these processes is also key to reducing choking risk.

Within the current setup throughout Scottish Rugby refereeing, the place to **train** this is likely to be **with a referee coach**. A **growth mindset** put into place and reiterated on a one to one basis with a coach during **meetings** and **calls** and then taken into games by the match official would **improve self-efficacy** and therefore influence of performance evaluation. This would, however, mean training coaches on the MAPP, ACT, GIRD.



It is important to note that some responses to pressure and choking may be clinical such as anxiety disorders and these should be dealt with professionally, with the understanding of all relevant parties^[27].

Stress control:

Stress occurs a lot in early stages of refereeing. Training **stress control** is **important** in many fields such as surgery and military. One review of literature into the military found that the best method for training stress control is exposure to **task specific stressors**^[28]. For refereeing this means encountering difficult events such as **tight ends to games**, **high stakes** games and **challenging players** or coaches. The review concluded the most reliable way to train this was to put soldiers in the specific stressful situations. Therefore, the clear way to train this factor is **exposure to difficult games**.

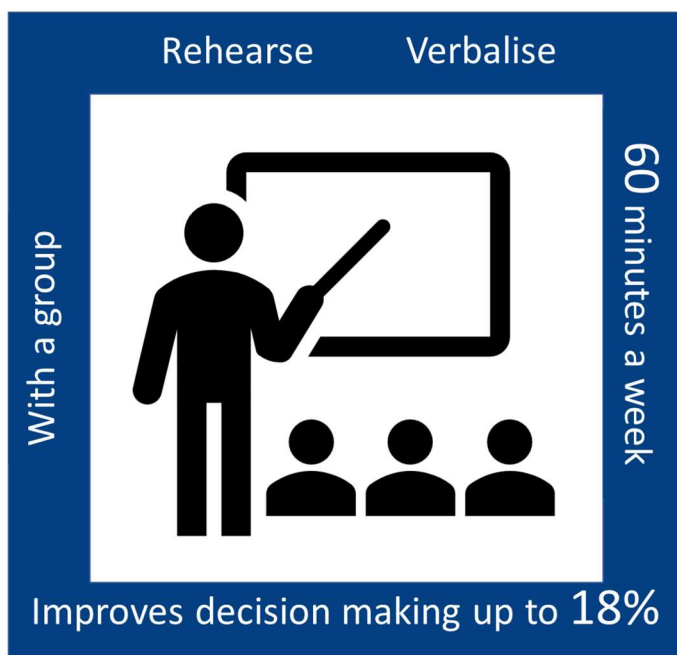
Mental Skills:

Mental skills includes many of the attributes that referees identify as important.

A 2020 study into surgery shows that skills simulation improves performance more than video viewing^[29]. **Verbalising**, **rehearsing** the process and **relaxing** were key to improving outcome. Relaxation can help with all mental factors such as choking and stress control.

Scottish Rugby currently incorporates video viewing, group interaction and conversation during meeting sessions. This allows all members to verbalise their process in decision making and incorporates it within a social setting, making it a more relaxing environment.

For highly involved officials, monthly training sessions are insufficient. Training sessions can be resource intensive to perform centrally. The recommendation is therefore that video clips and processes to practice are shared by **training groups** and societies where possible and that match officials should be encouraged to meet with their training groups to perform **mental skills training** once a week for **60 minutes**. This can **improve decision making** up to 18% and accelerate development of shared mental models^[30]. Training can be immediately after a physical session if the time suits them or over video.



Motivation:

Motivation is probably the most key innovation for Scottish rugby referees to develop to gain referee retention and improve performance.




Refereeing is amateur, therefore less well paid than other sporting roles so monetary motivation is very slim^[31]. With being amateur comes work-sport-life balance issues that make it likely that sport will come last out of those.

Overwhelmingly throughout the literature on motivation, in any volunteering, motivation to continue is largely through **connection with others** and **commitment**^[32].

Connecting with others makes people feel encouraged to turn up, gives them someone who can motivate them when they feel less inclined to train and gives them **something to look forward to**. This will **improve quality** of referees as training programmes are upheld and may also **improve referee retention** as training can be used to **see friends** and **socialise** as well as reinforcing their appreciation for their role with each other.

Training groups can **train anywhere** such as a park or a gym or with a deal with a rugby club and can influence each other's mental and physical preparation as well. Ideally, once this is well established there will be a turnover of referees within the training groups with new referees coming in and **new relationships** being built, **improving motivation** of more referees and therefore improving performances of more Scottish referees.

Make Friends


Training Groupchat



Great session yesterday. Looking forward to seeing you all next Wednesday @ 6

Nah lads, watching Glasgow at 7

Lol lazy Tom on the bevvs again. Shifting pints over shifting weights

Aff the sickies Tommy No bench no hench

Aye alright I'll be there Wed at 6?

YAAAASS! Mad Tam's gonna PB his squats

Buzzin to see you all lads! :)

Type a message...



Evidence

There is already evidence to suggest motivation benefit within Scottish rugby through the group that train at Murrayfield gym on a Wednesday night. They have a **known meeting time** and **location** that is **consistent** and know similar people and **friends** will be there each week. They are **competitive** with each other leading to **performance improvements** and demonstrate appreciation for the benefits that their training group imparts on them.

Training groups can interact by:

- WhatsApp
- Messenger
- Snapchat
- Email
- Regular meetings
- Social occasions



Mental Stamina:

The final mental attribute that would have significant impact on refereeing performance is 'mental stamina'. This means the ability to retain mental skills through fatigue.

It is clear to note that to resist fatigue it is best not to already be fatigued, so plenty of **sleep** is an obvious recommendation. **Concentration** can be improved by performing '**brain games**'^[33], **exercising**^[34], sleep and **mindfulness**^[35]. These are the 4 key recommendations to improve performance. This can be implemented by a few brain games on the phone after dinner 3 or 4 times a week as well as following the training programmes worked between the referee and the coach and relaxing before a game in the changing room. Things to avoid are smart phones at night, too much social media, excessive alcohol and staying up too late^[36].

How to Improve Mental Stamina

Things to do:	Things to avoid:
 Sleep	 Social Media
 Brain Games	 Smart phones at night
 Exercise	 Alcohol
 Relax	 Late nights





Recommendations For Nutritional Preparation

Rugby referees can:

- Follow the Eatwell plate
- Increase carbohydrate intake leading up to performance
- Remember their half time jelly babies
- Take advice from a professional before taking any supplements
- Don't take diet too seriously

In order to optimally nutritionally prepare for performance.

A Balanced Diet For Referees

On a non-training day, a referee would be likely to benefit from following general **government health guidelines**. This can vary slightly depending on profession, but any major deviation should be discussed with a professional. On training days, a referee would benefit from **increasing carbohydrate intake** by between 500-750kcal^[37], widening the **yellow portion** of the Eatwell plate.

Nutrition for playing days is based around an average but have wiggle room related to potential differences in energy use that could occur for a referee through any given game.

Scottish Rugby promotes a **food first policy** to nutrition, therefore only food based approaches will be recommended. This policy exists to **limit danger** from **unregulated supplements** and maintain **athlete health**. Referees should observe the [Scottish Rugby position on nutritional supplements](#) if they are thinking of taking nutritional supplementation such as vitamin D tablets.

The eatwell plate

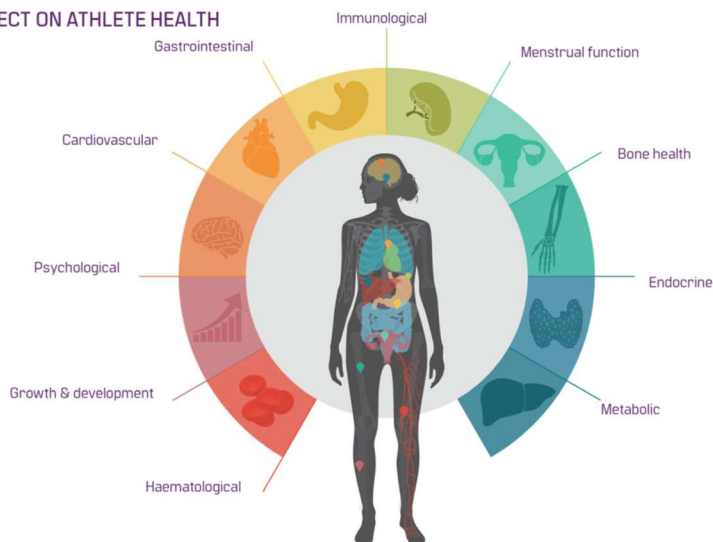
Use the eatwell plate to help you get the balance right. It shows how much of what you eat should come from each food group.



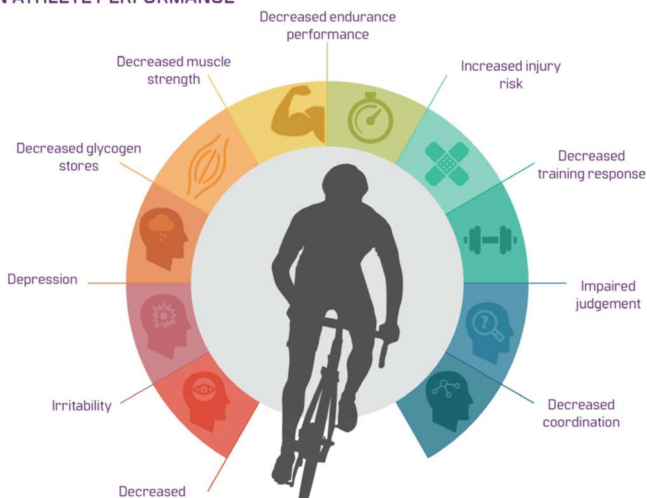
Balanced Diet:

The nutritional demands of refereeing can be met in many different ways and no single way is better than most others. An individual should not deviate from their recommended intakes significantly and regularly. Significant positive deviation in macronutrient intake can lead to **diabetes**, **heart disease** and **cancer**^[38]. Eating significantly less than recommended is common in athletes and will likely lead to Relative Energy Deficiency in Sport (**RED-S**). This can cause **menstrual dysfunction** in female athletes, **slow injury healing** and increase **risk of bone breaking** and is linked with **poor self-esteem** and **depression**^[39]. It is important not to be over cautious or overly prescriptive with food intake. This can lead to a host of **eating disorders** from dysmorphia to bulimia nervosa. As well as being significant health risks, all of these can affect sporting performance, so balance is key.

EFFECT ON ATHLETE HEALTH



EFFECT ON ATHLETE PERFORMANCE













From Keay & Rankin, 2019^[40]

Adapted from: Williams et al., 2016^[16]

Notes For Carbohydrate Intake		
Situation	Carbohydrate Intake	Helpful Notes
Day before game	6-10g/kg	Pastas & potatoes are popular high carb foods
Match day breakfast	1-3g/kg	Try not to fill up too much
Pre match meal	1-3g/kg	3-4hrs before kick off
During match	30-60g/hr	Jelly babies and Jaffa cakes are examples of mixed fructose & glucose foods
Post match	1.2g/kg	Engage in the post match meal to build relationships. High carb foods such as pastas can promote glycogen resynthesis
Day after game	6-10g/kg	Addition of high protein foods can help recovery
Training day	4-6g/kg	Adapt to training needs. Discuss with a nutritionist for any specifics

In a study of female soccer players, none had sufficient vitamins D and E and very few had sufficient iron in their blood^[17]. While this is a separate population, physical requirements of soccer players and referees are similar and it is unlikely that diets will be significantly different either. This is not an exhaustive list, but here are examples of available foods containing Vit D, E or digestible iron.

Foods containing:		
Vitamin D	Vitamin E	Digestible Iron
 Milk  Cheese  Egg  Milk Products	 Nuts  Nut oil  Fish	 Red Meats  Steak  Dark Chocolate



Practical Eating:

It is known that a referee cannot control what meals are presented on match day, and if we are to promote friendships and social interactions between referees, it would be illogical to discourage referees from taking part in post-match meals.

Referees often struggle to understand how to incorporate a balanced diet into their everyday lives. To demonstrate how this is possible, an example of a training day dietary intake and the types of food involved is found below. Foods can be changed to suit individual likes and needs and times can be slightly changed to fit different lifestyles.

Example Healthy Training Day For A Male Referee (Approx. 3000kcal)

7-8 Breakfast	9-12 Work	12-1 lunch break	1-5 work	5:30-6 Dinner	6:30-8:00 training	9PM Supper
Orange Juice	Water	Water	Water	Strawberry Milkshake	Water	Hot Chocolate
Large Bowl of Cereal	N/A	2 Sandwiches w/ Cheese, Ham, Tomato, Cucumber, Lettuce	Banana	Sweet Potato Mash Medium Steak Frozen Mixed Vegetables		3 Crackers Cheese Handful of Nuts

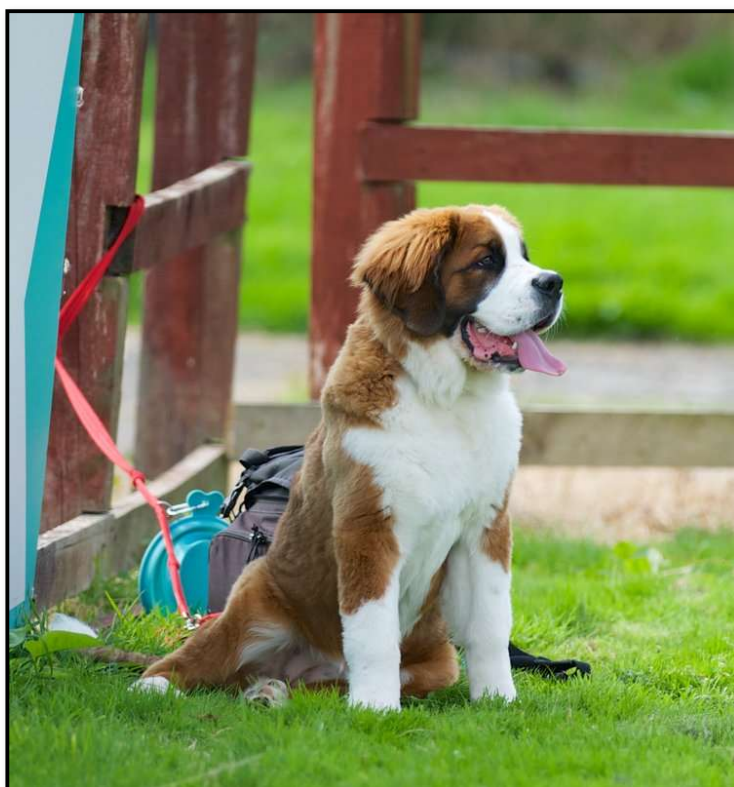
Conclusion

Preparation to for optimal refereeing performance contains many challenges from working through family life to processing the most intense events that occur on a rugby pitch.

Dealing with these can appear a daunting task, but with effective guidance, refereeing can become a very manageable pastime, helping to improve referee recruitment and retention.

Physical, mental and nutritional preparation can be managed through a common sense approach, friendships, support networks and time management.

Active training and a growth mindset become key activities for referees looking to improve their performance.



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FIFA 11+

PART 1 RUNNING EXERCISES - 8 MINUTES

<p>1 RUNNING STRAIGHT AHEAD</p> <p>Run forward at a pace for 10 seconds of your drill course, repeat 10 times, about 10m apart. On the 10th second, stop and turn around. On the 11th second, run back to the start. Repeat for each pair of cones. 2 sets.</p>	<p>2 RUNNING HIP OUT</p> <p>Stand on your heels, stepping at each pair of cones to 10m apart and rotate your hip outwards. Alternate between left and right hip at successive cones. 2 sets.</p>	<p>3 RUNNING HIP IN</p> <p>Stand on your heels, stepping at each pair of cones to 10m apart and rotate your hip inwards, alternating between left and right hip at successive cones. 2 sets.</p>
<p>4 RUNNING CIRCLING PARTNER</p> <p>Run forward at a pace for 10 seconds of your drill course. On the 10th second, stop and turn around. On the 11th second, run back to the start. Repeat for each pair of cones. 2 sets.</p>	<p>5 RUNNING SHOULDER CONTACT</p> <p>Run forward at a pace for 10 seconds of your drill course. On the 10th second, stop and turn around. On the 11th second, run back to the start. Repeat for each pair of cones. 2 sets.</p>	<p>6 RUNNING QUICK FORWARDS & BACKWARDS</p> <p>Run forward at a pace for 10 seconds of your drill course. On the 10th second, stop and turn around. On the 11th second, run back to the start. Repeat for each pair of cones. 2 sets.</p>

PART 2 STRENGTH - PLYOMETRICS - BALANCE - 10 MINUTES

LEVEL 1	LEVEL 2	LEVEL 3
<p>7 THE BENCH STATIC</p> <p>Starting position: Lie on your front, supporting yourself on your forearms and feet. Your elbows should be directly under your shoulders.</p> <p>Exercise: Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>	<p>7 THE BENCH ALTERNATE LEGS</p> <p>Starting position: Lie on your front, supporting yourself on your forearms and feet. Your elbows should be directly under your shoulders.</p> <p>Exercise: Lift your body up, supported on your forearms, and pull your elbows in. Lift one leg up, holding for 4 seconds. Lower the leg. Repeat for 30 seconds. 3 sets.</p>	<p>7 THE BENCH ONE LEG LIFT AND HOLD</p> <p>Starting position: Lie on your front, supporting yourself on your forearms and feet. Your elbows should be directly under your shoulders.</p> <p>Exercise: Lift your body up, supported on your forearms, and pull your elbows in. Lift one leg up, holding for 4 seconds. Lower the leg. Repeat for 30 seconds. 3 sets.</p>
<p>8 SIDEWAYS BENCH STATIC</p> <p>Starting position: Lie on your side with both legs bent at 90 degrees. Support your body on your forearms and feet. Your elbows should be directly under your shoulders.</p> <p>Exercise: Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>	<p>8 SIDEWAYS BENCH RAISE & LOWER HIP</p> <p>Starting position: Lie on your side with both legs bent at 90 degrees. Support your body on your forearms and feet. Your elbows should be directly under your shoulders.</p> <p>Exercise: Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>	<p>8 SIDEWAYS BENCH WITH LEG LIFT</p> <p>Starting position: Lie on your side with both legs bent at 90 degrees. Support your body on your forearms and feet. Your elbows should be directly under your shoulders.</p> <p>Exercise: Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>
<p>9 HAMSTRINGS BEGINNER</p> <p>Starting position: Stand on a flat surface. Put your partner to hold your ankles from behind.</p> <p>Exercise: Your body should be completely straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>	<p>9 HAMSTRINGS INTERMEDIATE</p> <p>Starting position: Stand on a flat surface. Put your partner to hold your ankles from behind.</p> <p>Exercise: Your body should be completely straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>	<p>9 HAMSTRINGS ADVANCED</p> <p>Starting position: Stand on a flat surface. Put your partner to hold your ankles from behind.</p> <p>Exercise: Your body should be completely straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>
<p>10 SINGLE-LEG STANCE HOLD THE BALL</p> <p>Starting position: Stand on one leg. Hold the ball with both hands. Keep your body straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>	<p>10 SINGLE-LEG STANCE THROWING BALL WITH PARTNER</p> <p>Starting position: Stand on one leg. Hold the ball with both hands. Keep your body straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>	<p>10 SINGLE-LEG STANCE TEST YOUR PARTNER</p> <p>Starting position: Stand on one leg. Hold the ball with both hands. Keep your body straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>
<p>11 SQUATS WITH TOE RAISE</p> <p>Starting position: Stand on one leg. Hold the ball with both hands. Keep your body straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>	<p>11 SQUATS WALKING LUNGES</p> <p>Starting position: Stand on one leg. Hold the ball with both hands. Keep your body straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>	<p>11 SQUATS ONE-LEG SQUATS</p> <p>Starting position: Stand on one leg. Hold the ball with both hands. Keep your body straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>
<p>12 JUMPING VERTICAL JUMPS</p> <p>Starting position: Stand on one leg. Hold the ball with both hands. Keep your body straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>	<p>12 JUMPING LATERAL JUMPS</p> <p>Starting position: Stand on one leg. Hold the ball with both hands. Keep your body straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>	<p>12 JUMPING BOX JUMPS</p> <p>Starting position: Stand on one leg. Hold the ball with both hands. Keep your body straight from the shoulders to the hips. Lift your body up, supported on your forearms, pull your elbows in, and hold the position for 30 seconds. 3 sets.</p>

PART 3 RUNNING EXERCISES - 2 MINUTES

<p>13 RUNNING ACROSS THE PITCH</p> <p>Run across the pitch, from end to end, at 80% maximum pace. 2 sets.</p>	<p>14 RUNNING BOUNDING</p> <p>Run with high bounding, from end to end, at 80% maximum pace. 2 sets.</p>	<p>15 RUNNING PLANT & CUT</p> <p>Run with high bounding, from end to end, at 80% maximum pace. 2 sets.</p>
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