

INDOOR ROWING
Rugby Training Guide

Peter Herbert



concept 2
INDOOR ROWER



Peter Herbert BSc, MA, Accredited Exercise Physiologist

Peter Herbert has been involved in fitness for forty years. He is a retired exercise physiology lecturer and was Fitness Adviser to Llanelli RFC (1985 – 2000) and the Wales Rugby Team between 1992 – 1994 and 2000 – 2002. During these periods Llanelli enjoyed their most successful period winning numerous National League and Cup Finals, reaching the European Cup semi-finals twice and beating Australia, the then World Champions in 1993. He has worked with the armed services, including members of the elite forces and he has trained boxers who have won World and Commonwealth Medals. Practicing what he preaches, Peter has the best times ranked for the over 60 lightweight 500m and 1000m and is ranked 2nd for the 2000m in 2005 Concept 2 World Ranking.

- 1. Rugby, The Modern Game**
- 2. Physiological Demands**
- 3. Specific Training**
- 4. Cross Training**
- 5. Injury Prevention**
- 6. Rehabilitation**
- 7. Testing**
- 8. Training Programmes**
- 9. Heart Rate**
- 10. Nutrition**
- 11. Periodisation**
- 12. Getting It Right On The Day**



SECTION 1: Rugby, The Modern Game.



Rugby requires its players to possess the stamina of a middle distance runner, the strength of a weightlifter, the power of a gridiron footballer, the speed of an international sprinter and the flexibility of a gymnast. To add to this complexity all fifteen players require all these characteristics but in varying degrees.

A rugby player needs to produce a top performance almost every Saturday of the season. They cannot afford to relax their fitness preparation; if they do the game could be lost and the season with it. So how is it possible for players to produce this 'top performance' week in, week out? In truth, it is not. However, by training smart a player will include the correct balance of training, recovery and relaxation, which will enable him to arrive for games in optimal condition.

Consider a typical week in the life of a professional rugby player where the next game is in six days time. He will need to manage his time in such a way that the training will cover most, if not all of the fitness components required for rugby. This will include weight training for strength and power; interval running for stamina; sprint training for speed; resistance running and plyometrics for running power and acceleration; and stretching for flexibility.

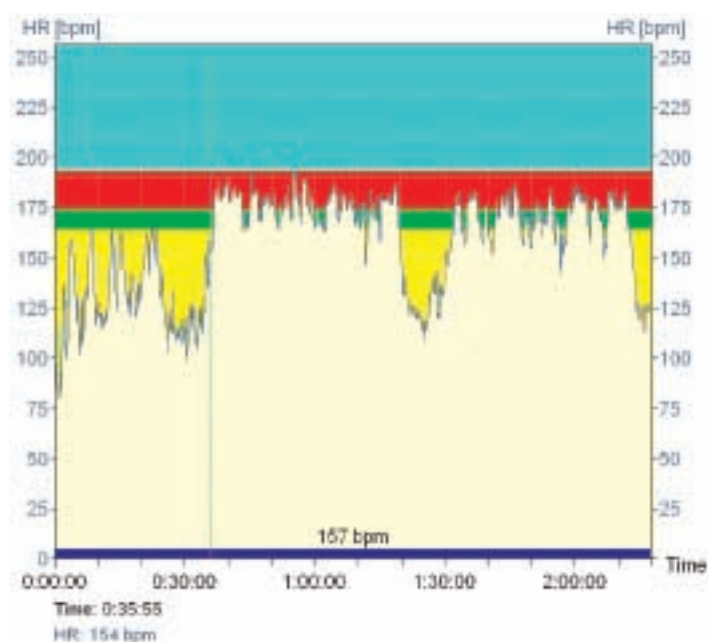
His diet will need to provide the balanced intake of carbohydrates, proteins, fats and minerals for energy and recovery and good health. This food intake will also need to be of the correct volume. Too many calories and the player could increase fat levels, which will be detrimental to performance, too little, and muscle tissue could be lost

lowering strength and power potential. Finally, he must ensure he has adequate rest. This will be the time when muscles can recuperate from exercise and the body becomes 'recharged' to be ready for the next training session and more importantly to be ready and fully charged for Saturday's game.

Physiologically, rugby players have to perform intermittent high intensity and low intensity work during phases of play and throughout the game. This demands high levels of anaerobic and aerobic endurance. Phases of play can vary from 10 seconds to over three minutes so conditioning will be geared to cope with the maximum demands. The high-speed modern game demands that players of all positions are capable of producing high power high strength movements in extreme physical situations. Whilst all players will require a highly efficient aerobic component of their fitness to encourage speedy recovery from maximal efforts, backs tend to enjoy longer recoveries during ball-in-play time.

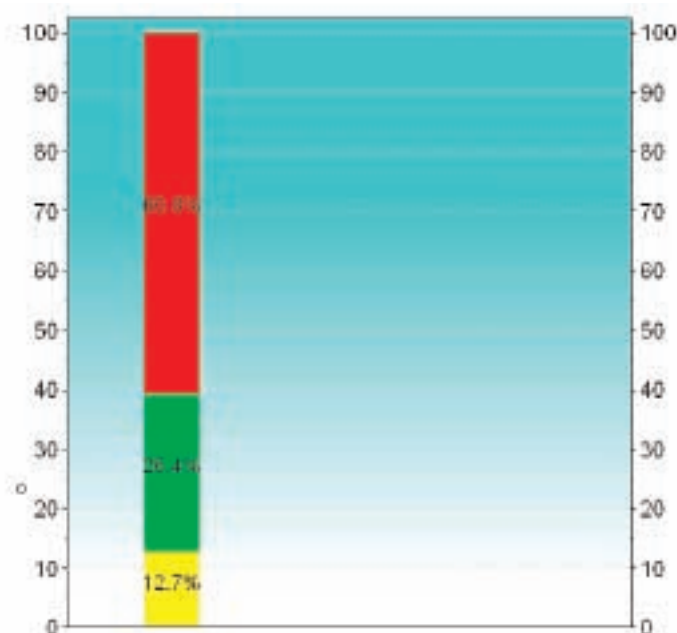
Each position in a team has different fitness and skill requirements. This can be clearly seen when comparing the forwards with the backs. For example, the backs are essentially there for their speed and mobility, covering distances of 10-60m, and on extremely rare occasions the full length of the field. In contrast, the forwards are physically much bigger in terms of body mass and are typically required to do significantly more work during the course of a game. In addition, the forwards are required to possess a high degree of strength and power and perform explosive runs of 5-15m repeatedly throughout a game.

Rugby is a game that is made up of intermittent periods of work alternating with periods of rest. The work is made up of sprinting, running, jogging, walking and due to the contact and combative nature of the game demands strength and power. The work periods are usually of high intensity varying in duration from under 5secs to over 3 minutes. Rest periods vary from 10secs up to 2 minutes. This type of activity demands high levels of anaerobic and aerobic fitness.



Simon Easterby's heart rate during a European Cup Match. His heart rate was over 90% of his maximum for over 60% of the game.

When rugby players perform these high-intensity activities, their anaerobic systems provide the required energy, while the aerobic system predominates during the low-intensity activities and recovery.



SPEED - STRENGTH - STAMINA

	Outside Backs	Inside Backs	Front Five	Back Row
1	Speed	Speed (Accel)	Strength	Stamina
2	Stamina	Stamina	Stamina	Speed
3	Strength	Strength	Speed	Strength



It is generally accepted that for rugby players to reach their full potential, the majority of training will be specific i.e. running, sprinting, scrummaging, skills and drills. Modern rugby players are bigger, heavier and faster and these factors can combine to shorten the player's career in two ways. Firstly as a result of increased impact damage. The game is becoming more physical and impact damage from collisions is more numerous in the modern game, with 80% of players receiving more than one injury during a nine month season. RFU officials believe the greater physicality and fitness of players is the main reason.

The second is the fitter you become the closer to the limits of human capability you become and you are more prone to stress related injuries and infections.

One way to reduce this problem is a smarter approach to training. Drills and set plays are an important part in the preparation of players however contact and impact during training should be kept to an absolute minimum. The weekly game should be considered as the peak of the training week containing the bulk of the contact and impact element. Today it is commonplace for a coach to have 5-6 players unavailable for selection due to illness or injury. Professional rugby teams are businesses and any business that has 25 to 30% of its staff out of action has a serious problem

Years of rugby and repetitive rugby training drills can affect players with the accumulation of minor injuries and general fatigue. If general fitness levels are satisfactory, providing alternatives to the volume of running training performed by younger players can extend their playing time by a number of seasons. Regular sessions on the Concept 2 Indoor Rower will provide the necessary stimulus to maintain aerobic and anaerobic fitness. It will also provide a very necessary rest from the constant pounding of more specific rugby training.

Why Rowing?

In England's preparation for the World Cup Martin Johnson's injury history meant he only did one session a day on his feet. Most of his aerobic work was done on a Concept 2 rowing machine.

Games players need whole body aerobic fitness, not just individual muscle fitness, to perform. To raise the aerobic fitness level the entire body should be exercised and exercise on the Indoor Rower uses both upper and lower body muscles, therefore recruiting a very large muscle mass.

Quite often injuries sustained through contact are not to the primary mover of a particular joint but to the smaller muscles that support the joint, the fixators or synergists. Often training programmes fail to develop these muscles to the same extent as the primary mover. Cross training has the affect of developing muscles other than the prime movers used in the given sport, thus reducing the likelihood of impact damage. With the high number of games that players are expected to cope with the games themselves should be considered as part of the training programme. This means that skills and drills can be reduced in other parts of the programme and replaced with a safer method of fitness training.

If the statement that 'aerobic fitness underpins the whole performance' is true then it would make sense to follow the training programme of a rower. Rowers are generally recognised as athletes with amongst the greatest aerobic capacity. This is achieved with no risk of injury through impact, as training is weight supported and non-contact. A slightly modified programme currently used by rowers in preparation for their competitions would meet all the physical requirements of ball players.

There are very few training activities than can produce a high intensity upper body workout, involve the strongest muscles in the body, the legs, and raise the heart rate to cause almost immediate fatigue. These are the requirements and demands of a rugby player. They can be achieved by using a Concept 2 rowing machine.

Rugby players spend almost all their training time on their feet, performing technical drills, interval running or sprint training. Over time this repetitive, impact work can have a detrimental effect on the physical capabilities of the player, such as shin splints, ankle and knee strains and hamstring problems. Heavier players are particularly susceptible to injuries with high forces transmitted by their weight on running impact.

In the case of a player who is overweight and almost all of his training is spent running, extra running could possibly cause overuse injuries of the legs. So the extra work ideally needs to be non-weight bearing. This could be indoor rowing, where the work intensities are high enough and the duration long enough to sway the calorific balance to a loss of weight.



"I use the Concept ergometer to compliment the more specific running work required for International Rugby. It forms an essential part of my rugby training".

Simon Easterby Llanelli Scarlets, Ireland, British and Irish Lions.



"I need to keep in shape in my retirement from Rugby. The Concept 2 is a big part of that and helps me keep off the lbs and gives me an excellent workout"

Scott Quinnell Wales, British Lions(1997, 2001)

SECTION 4: Cross Training

The result of the cross training will be weight loss which indirectly improves running fitness.

For instance, consider the heavyweight prop forward at the beginning of his pre-season training period. He has a couple of urgent issues to address; one is to lose body fat and the other is to increase cardiovascular fitness. He may well need to improve other aspects of fitness such as flexibility, strength, power, speed and so on, but these may be addressed in more detail once a base has been established.

The most specific way for our man to develop endurance will be to carry out lots of running, which will also help him to lose fat. The trouble is that, being heavy, even if he runs on grass (which can be quite hard and unforgiving) and has well-made shoes, there is a fair risk that he will pick up injuries to his muscles and joints if he crashes straight into high mileage running. It would make sense for him to vary his workouts, with some running, cycling, to give his legs a rest from the pounding, along with some rowing and swimming. All these forms of activity will help him lose body fat and increase cardiovascular endurance, and with a variety of workouts there is less chance of overuse injuries occurring.

In fact, it is this avoidance of overuse injuries that is one of the strongest arguments in favour of cross training. Extra endurance work can be performed, with less strain placed on the same muscles and joints, which may indeed be getting an active rest, while at the same time there is still an adequate workout for the heart and lungs.

Rowing is non-weight bearing so will provide a training session with no impact but can create an intensity that can replicate and exceed those experienced in rugby. Match analysis provides us with the information that will determine work and rest periods that simulate actual game situations.

What really makes rowing an excellent means of complimenting traditional rugby training is its ability to provide the stimulus for cardiovascular improvements at the same time as helping increase power output. As opposed to just running, arms, shoulders and back must generate huge forces that will cause muscular adaptations that can be directly transferred to the rugby pitch.

Rowing exercises both upper and lower body - for rugby this is essential. It will cause the heart rate to increase to levels that will provide the stimulus for adaptation at the same time as strengthening muscles required for mauling, tackling and combative situations.

- Rowing is a non-impact exercise - thus imposing less impact-related wear and tear on the body. This is especially important for high impact sports like rugby.
- It adds variety to your programme.
- It offers a time-efficient method of aerobic improvement by using large muscle mass.
- It can provide excellent anaerobic workouts complementary to explosive power sport training.
- Rowing can be done indoors anytime – important when you consider the weather conditions that can disrupt outdoor rugby training.
- It is a safe and effective way of training whilst recovering from illness or injury.
- It is transportable, so can be used either at home or at other locations.
- Rowing on the Concept2 Indoor Rower provides a means for accurately monitoring your level of conditioning, and offers constant feedback during your rowing workouts.

Benefits and Purposes of Cross-Training

- Adds variety to your training and decreases the chance of burnout.
- Can occasionally be substituted for "easy day" running (as an aerobic workout).
- Can serve as an injury prevention measure - Rowing can strengthen related muscle groups and soft connective tissue.
- Provides an additional means of burning fat.
- Increases upper body strength - This is very important in a game that requires repetitive maximum and near maximum efforts during the game. This type of exertion will place very high demands on muscle strength and power.
- Improves the efficiency of the anaerobic energy supply for immediate maximal efforts.
- Improves the aerobic energy supply to maintain cardiac output and hasten recovery.

Precautions and Considerations

- Rowing is not meant to replace specific rugby training. Its purpose is to compliment specific work to achieve optimum performance.
- Players who have high aerobic fitness cannot expect to benefit as greatly as those with less fitness.

Psychological

Training programmes can often be monotonous and even the most motivated player feels the need for a change. Provided the specific work such as speed, intervals, weights etc. are performed consistently over a given period, it will be productive to provide an alternative form of training. It is often just the change that is required to 'lighten up' the regular routine and avoid boredom and 'staleness'.

Physiological

A well trained rugby player may not receive any direct benefits from including aerobic based rowing but may obtain indirect benefits over time from assisting with the optimisation of body weight and body fat, thermo-regulatory adaptation, physiological and psychological recovery, needed variety, and the prevention of injuries, burn-out and over-training. The indirect benefits are still specific - if not physiological then definitely outcome specific - as these

'indirect' benefits are important factors in maximising the development of endurance performance. The debate, therefore, stems from more than questioning the transfer (or cross-over) of peripheral physiological benefits.

Upper Body Strength and Power

Rowing will improve the strength and power of the upper body 'pulling' muscles. These particularly include the back, forearms and biceps. Rugby will continually stress these muscles because of their involvement in gripping, holding, squeezing, and pulling. When a player is wrestling to take a ball from an opponent, holding or lifting a player off the ball in a tackle or maul, these key muscles will come into play.

Increasing the drag on the Concept2 rower will provide a higher resistance. Combining this with a low stroke rate and maximal efforts on each pull will improve strength and power in muscles that are an essential part of being a better rugby player.





Recovery

During a match, contact with other players and high impacts will cause muscle damage. Small tears and bleeding in the muscle leaves debris, which if not dealt with will lead to muscle stiffness, reduced mobility and even loss of training time. One way to reduce the effects of muscle damage is to move the debris out of the muscle via the bloodstream. The best way to do this is to keep the blood flowing through the muscles at an elevated level immediately after the match because the sooner you can deal with it, the more effective the treatment.

A Japanese study concluded, "Rugby matches impose both physiological and psychological stress on players. The addition of low intensity exercise to the rest period did not adversely affect physiological recovery and had a significantly beneficial effect on psychological recovery by enhancing relaxation"

Because the Concept 2 Indoor Rower is non-impact this is a safe and sure way to keep the heart rate up and therefore increase the blood flow. You would need to row for between 30-40 minutes at a heart rate of around twice that at rest. If this is then followed by a good stretching routine it will help avoid post match day aches and pains.

If a player is injured and unable to play or take part in full club training, then alternative modes of activity must be found. In consultation with the medical staff a programme of rehabilitation should be put in place as soon as possible following the injury. If it is a leg injury and does not allow weight bearing but encourages movement around the injured joint, rowing is an excellent form of training. This encourages a high heart rate response that will help maintain or at worse, slow down the inevitable decline in stamina during an injury period. Once a certain level of strength, balance, range of movement and endurance have been restored, players need to focus on functional exercises that resemble the movements of rugby such as speed agility and dynamic strength

Light Week	Duration	% MHR	Strokes per minute
1	25min	70 - 80	22 - 24
2	3 x 10min (4min rest)	70 - 80	22 - 24
3	20min	70 - 80	22 - 24
Medium Week			
1	20min	80 - 85	24 - 26
2	3 x 8min (3min rest)	80 - 85	24 - 26
3	25min	70 - 80	22 - 24
Hard Week			
1	20min	90 - 100	28 - 32
2	3 x 4min (4min rest)	90 - 100	28 - 30
3	6 x 1min (1min rest)	90 - 100	28 - 30

Light Week: Recovery Sessions or following week's of hard rugby training

Medium Week: Replacing running sessions or during injury

Hard Week: High Intensity Intervals during injury or replacing running equivalent

SECTION 7: Testing & Testing Protocols

Testing will measure an individual's fitness on the Concept 2. It will provide the basis for all rowing workouts and training zones and targets can be prescribed from test results.

Peak Power Test

Athletes row for 10 strokes flat out to measure explosive anaerobic power. Monitor will show peak power value for each stroke plus average peak power.

Standards for the peak power test:

	Peak power (watts)	Average Peak power (watts)
World Class	1000	960
Excellent	950	910
Very Good	900	860

Anaerobic Power/Capacity

This test is designed to identify the ability of the athlete to repeat short maximal efforts with minimal rest. Athlete completes 10 seconds and average power is recorded. Rest time 25 seconds and repeated for a total of 5 repetitions. Both work and power decrement can be calculated from the results.

	Set 1	Set 2	Set 3	Set 4	Set 5	Set 6
World Class	900	882	865	848	831	865
Excellent	820	802	788	772	757	788
Very Good	750	735	720	706	692	720

Anaerobic Capacity

20 second test. Row as far as you can in 20 seconds.

	Distance in 20 seconds
World Class	170
Excellent	150
Very Good	130

Aerobic Capacity

This can be done either by a single 12 minutes test or 4 x 4 minute stepwise test where blood lactate levels are measured between each step.

The single 12 minutes test is less likely to be influenced by poor technique.

The 4x4 stepwise test will identify aerobic and anaerobic threshold power levels which is useful for prescribing future training session intensities.

Endurance

1000m followed by 3min rest, 750m followed by 2:30min rest, 500m followed by 2min rest, 250m followed by 2min rest, 750m finish. Record time taken when rowing.

	Total Time
World Class	<10.00
Excellent	10.00 - 10.30
Very Good	10.30 - 11.00



THE 10 MOST IMPORTANT TIPS FOR RUGBY FITNESS

1. Get fitness tested, find your weaknesses and work on them
2. Pre-season is the most important time for improving most aspects of fitness
3. Plan your programme with your coach at least 6 weeks ahead
4. Excess fat will slow you down and lower your stamina levels
5. Recover properly after each training session (active, light rowing, massage, hot/cold)
6. Never neglect high intensity stamina training, whatever your position
7. Work in cycles of 4 – 6 weeks on your strength and power programmes
8. Take a recovery week following a cycle of training
9. Every player, irrespective of position will benefit by getting quicker
10. Never leave a fitness session without giving 100%

For training to be meaningful and objective it is necessary for players to find their maximum scores in 1000m, 500m, 60s, and 20s and maximum heart rates.

During longer rows the player will be able to train in heart rate zones that will provide them with the most benefits. In shorter, high intensity rows they would be expected to achieve at least 90% of their maximum distances on each interval.

It has been shown that forwards tend to have less recovery time between work efforts to be able to compete in ruck and maul situations in open play although the modern game demands all players have high strength and power levels.

Training for Forwards

Forwards tend to perform more high-intensity 'physical work' than running, as a result performing intervals on a rowing machine is more sport-specific training.

Sample Session: Forwards

5 sets of 4 x 250m fast rowing, with 30s rest between reps and 2 minutes between sets.



Training for Backs

Backs, in contrast to the forwards, need high anaerobic power, targeting the Phospho-creatine(PCr) energy system. Interval training is also a very effective route to PCr fitness, but the work intensity must be higher and the rest periods longer than with intervals targeting the glycolytic energy system.

Sample Session: Backs

5-8s reps and rest periods lasting a minimum of 60s would be highly appropriate, eg 10 x 50m sprints with 90s recovery.

For backs, this sprinting workout would be highly sport-specific, reflecting the amount of high-intensity running they perform in matches.

Aerobic fitness is important for both backs and forwards, since the aerobic system will provide most of the energy for

movement and replenishment of PCr stores during all low-intensity activities. In addition, research has demonstrated that players with high aerobic fitness are able to perform more high-intensity efforts during a match than those with lower levels of this type of fitness because of the aerobic system's influence on recovery. Forwards will also use their aerobic systems to provide energy for the longer high-intensity or shorter recovery periods, providing valuable back-up for the anaerobic glycolytic system.

As far as aerobic endurance training is concerned, the rowing machine may still be the best activity choice for forwards, with running best for backs. A combination of continuous steady state training and interval workouts would be an effective approach: for example,

Sample session: Aerobic Fitness Development

20 minutes row at 75% of max heart rate, or 10 x 400m running with 60s rest, or 6 x 500m rowing with 2 minutes rest.

High Intensity Aerobic Conditioning (Pre-season, In Season)

		Rest between reps	Stroke Rate	% MHR	Damper
1	8 x 500m	90 secs	30 - 35	85 - 90%	High
2	4 x 2000m	5 mins	26 - 28	85 - 90%	Medium
3	2 x 1000m	3 mins	28 - 32	85 - 90%	High/Medium

Low/Medium Intensity Aerobic Conditioning (Recovery, Off Season)

		Stroke Rate	% MHR	Damper
1	30 mins	22 - 24	80 - 85%	Medium/Low
2	5000m	22 - 24	80 - 85%	Medium/Low
3	4 x 2000m	22 - 24	80 - 85%	Medium/Low

Anaerobic Conditioning:

		Rest between reps		Damper
1	10 x 10 secs	40 secs	Max Effort	High
2	12 x 250m	90 secs	Max Effort	High
3	Max effort for 60secs. Record Distance. Rest 60secs. Repeat 6 times. Calculate Fatigue Index			

Circuit Training - An excellent method of simulating the demands of the game.

Even more specific to the demands of match play would be interval workouts that combine 'physical work' with running. This would prepare players to work intensively and make appropriate transitions between upper body/trunk strength tasks and running. This kind of workout would provide a close match of both the energy system and physical task demands of forwards' match play.

	Circuit	Rest	Repetitions
1	20 secs row, 15 secs punch pads 20 secs row, 15 secs press-ups 20 secs row	45 secs	6

Team Training on the Indoor Rower

Training on the Concept 2 Indoor Rower is an excellent way to improve fitness but it is a singular activity, whereas rugby is a team sport. However, there are ways in which you can use the machine as a team and develop coordination as well as improving fitness.

Divide into 3's with one man on the machine and the other two holding his feet on the footplate (do not use the straps). Set the monitor to 5,000m and the first man rows as hard as he can for 15 strokes. At the end of this he rolls off the machine to his left to hold the left foot of the man on the right who has replaced him on the machine. The third man who was holding the left foot moves around to hold the right foot of Rower No.2.

Continue this operation, taking it in turns to row 15 flat out strokes until you have completed 5000m as quickly as possible. Race against another team. Apart from developing good teamwork it is excellent training for the ATP/CP energy system.



The following sessions have been created by Wayne Proctor, conditioner of Llanelli Scarlets. Each player will have their own target depending on their abilities. The targets shown give an indication of the range in which Wayne expects his players to perform.

Speed Training

Session 1

3 sets x 8 reps 100m row @ maximal pace – 40s recovery between reps 3-4mins between sets

Target pace:

Sub 1m 26s / 500m target – achieved within 3-4 strokes at the start of each rep

Session 2

3 sets x 8 reps 10s sprint / 10s cruise / 10s sprint @ maximal pace –

1 min recovery between reps 3-4 mins between sets

Target Pace:

Sub 1m 25s-28s / 500m target for sprint

Sub 1m 50s / 500m target for cruise

Session 3

3 sets x 10 reps 10s sprint @ maximal pace –

6 med ball slams into ground - recovery between reps

2-3 mins between sets

Target Pace:

Sub 1m 25s / 500m target for sprint

Sub 1m 50s / 500m target for cruise

Speed Endurance Training

Session 1

500m intervals

Target time sub 1:42

2 mins recovery between reps

As many reps as possible

11 – Lee Byrne

10 – Ian Boobyer

Session 2

6 x 500m intervals

4 x 250m intervals

500m Target time < 1 min 35s all 6

250m Target time < 55s all 4

Additional target – maintain a drop off of less than 10s for both 500m & 250m

Lee Byrne

Performed all 6 x 500m with 13s drop off. Quickest 1.23s – Slowest 1 min 36s

Performed all 250m under 51s

Session 3

Intervals of 50m up to 500m, increasing 50m per interval, and back down

Maximal pace throughout

1:1 recovery for each rep (All players reckon it's the hardest they perform)

Session 4

This session is used during periods of heavy fixture schedules for those players who do not get much playing time.

Targets would obviously be not that impressive for the type of player being trained

In-season sessions

Week No.	Distance	Reps	Rec	Total Dist.
1	1000	1	1:1	2250
	750	1	1:1	
	500	1	1:1	

Week No.	Distance	Reps	Rec	Total Dist.
2	750	2	1:1	2500
	500	2	1:1	

Week No.	Distance	Reps	Rec	Total Dist.
3	750	1	1:1	2250
	500	3	1:1	

Week No.	Distance	Reps	Rec	Total Dist.
4	500	5	1:1	2500

Aerobic Training

Session 1

3 x 1000m

Target Pace:

Rep 1 sub 3:15, Rep 2 sub 3:20, Rep 3 sub 3:30

3 x 500m

Target Pace:

All sub 1m 40-42s

1:1 rec for all reps

Session 2

Rep 1 – 2 min row @ sub 1m 40s / 500m pace

30s rec

Rep 2 – 3 min row @ sub 1m 45s / 500m pace

60s rec

Rep 3 – 3 min row @ sub 1m 48s / 500m pace

60s rec

Rep 4 – 3 min row @ sub 1m 50s / 500m pace

60s rec

Rep 5 – 10 inclusive – 30s row @ sub 1m 35s / 500m pace

30s rec between reps

Rep 11 – 20 inclusive – 10s row @ sub 1m 30s / 500m pace

Session 3

3 x 2000m (3:00 recovery between reps)



The following was created by Steve Carter, the conditioner at Leeds Tykes.

At Leeds Tykes we use a variation on the Dallas Test in our training.

The Dallas Test:

3 x 1 minute maximum intensity efforts with 1 minute recovery between reps.

Target Distance: 1000m.

We have edited the Dallas test to better suit our needs and call it the Leeds Test.

The Leeds Test:

6 x 30s maximum effort with 30s recovery between intervals.

Target Distance: 1000m

Although the target is 1,000m some of the shorter players struggle to get the full 1,000m and average around 970m – this is less important as we use this session to monitor improvement.

10 x 300m

This session is constructed individually for each player depending on their ability levels and individual requirements, the larger stronger players are given less rest than the shorter players.

10 x 300m, each 300m should be done in under 60s, 30 – 60s rest between each rep.

Team Sessions

We also use the Indoor Rowers in team sessions. This session is good for team building as well as being very flexible in the training effect you can get from it.

Teams of four row a total of 10,000 – 15,000m. Two members of the team hold the rowers feet in place, one is ready to get on, one rowing. At the change over the rower rolls off, the new rower gets on, then the people holding the feet move round one space.

To change the type of training achieved you can define the distance or time that you would like the player to row for before change over.

This session can also add a competitive edge if there is more than one team doing the session.

Recovery Training

We use the Indoor Rowers in our recovery sessions in conjunction with exercise bikes and treadmills. A typical recovery session would be:

Row 2 x 500m, 1 minute rest,

Target Pace: Between 1:50 – 2:00 /500m

HR around 70-75% max.

This session would be carried out twice within a recovery training session.



There is a linear relationship between heart rate and work output. The harder you work, the higher the heart rate. Heart rate indication tends to be very reliable when the exercise mode is rhythmic, such as rowing. It can provide the player with a target zone that will cause the optimum fitness benefit.

Rugby is an intermittent exercise where short periods of high intensity exercise are randomly interspersed with longer periods of either passive or active recovery. It is possible to simulate this type of work output by obtaining heart rate traces of players in intense periods of a game and using these to indicate the type of response required in training situations.

When exercise intensity increases there is a proportional increase in heart rate. This is true in most instances in rugby although it must be remembered that during heavy static work (scrummaging) the heart rate tends to underestimate the work output.

Maximum Heart Rate

Prior to using heart rate as the guide to how hard a player is working it is important that a true maximum heart rate is found. Without this information it is impossible to ascertain the intensity of the workout. Avoid using the '220 beats – age'. This is far too inaccurate. Use a maximal test such as jogging four lengths of the pitch followed by a further six lengths at a 'fast' running pace. By the end of the last two

SECTION 9: Heart Rate

lengths you should be close to sprinting. The final two lengths are performed at an all out sprint. The heart rate achieved will be your maximum. Maximal tests such as a bleep test or VO₂max test will also find your maximum heart rate. Your maximum heart rate on the Concept 2 can often be up to 5 beats lower than your running heart rate max.

Heart Rate Training

It is generally accepted that to improve your overall stamina you will need to get your heart rate over 85% of your maximum. This level of intensity will have you breathing very heavily and probably muscles beginning to tire but you will be able to maintain this intensity for at least 20 minutes. The extreme level of exercise that is required for simulation of the most demanding periods of the game and that which will do the most to improve your ability to cope with the high aerobic and anaerobic demands will be over 90% of your maximum - The Red Zone. This exercise can be classed as high intensity aerobic/anaerobic training. This level will be when your lungs feel like bursting, your muscles ache with lactate accumulation and you will be unable to maintain this intensity for very long periods. This is when the real adaptations will occur and fitness improves.

Although heart rate monitoring is fairly simple there are sometimes circumstances that can cause slight variability in readings. If exercise is carried out in very high temperatures heart rates can increase by a few beats/minute. If players are dehydrated this can also cause heart rates to increase. Heart rates when swimming can be up to 10 beats/min lower than for a similar exertion when running.

Heart rate monitoring for your fitness will enable you to:

- Monitor the exercise intensity of your rugby sessions
- Motivate you to achieve more in each workout
- Minimize the risk of over training
- Record your training sessions

Maximal Endurance Training Heart Rate Zone

Maximal endurance exercises are performed at the heart rate zone between the anaerobic threshold and the maximal oxygen uptake. Heart rate is 90 – 100%. Subjectively, these exercises can be described as 'heavy' or 'very heavy'.

For young players to improve, it is sufficient to exercise at the anaerobic threshold rate or slightly above, whereas for more experienced athletes the heart rate must be close to maximum. Too much maximal endurance training may

make it more difficult to achieve maximal performance.

In practice, all exercises performed above the anaerobic threshold are effective in improving endurance. The anaerobic threshold will usually fall between 85% and 90% of the maximum heart rate.

The exercises must be performed at a high intensity, but too high a level places too much stress on anaerobic energy production and oxygen consumption does not reach a maximum level.

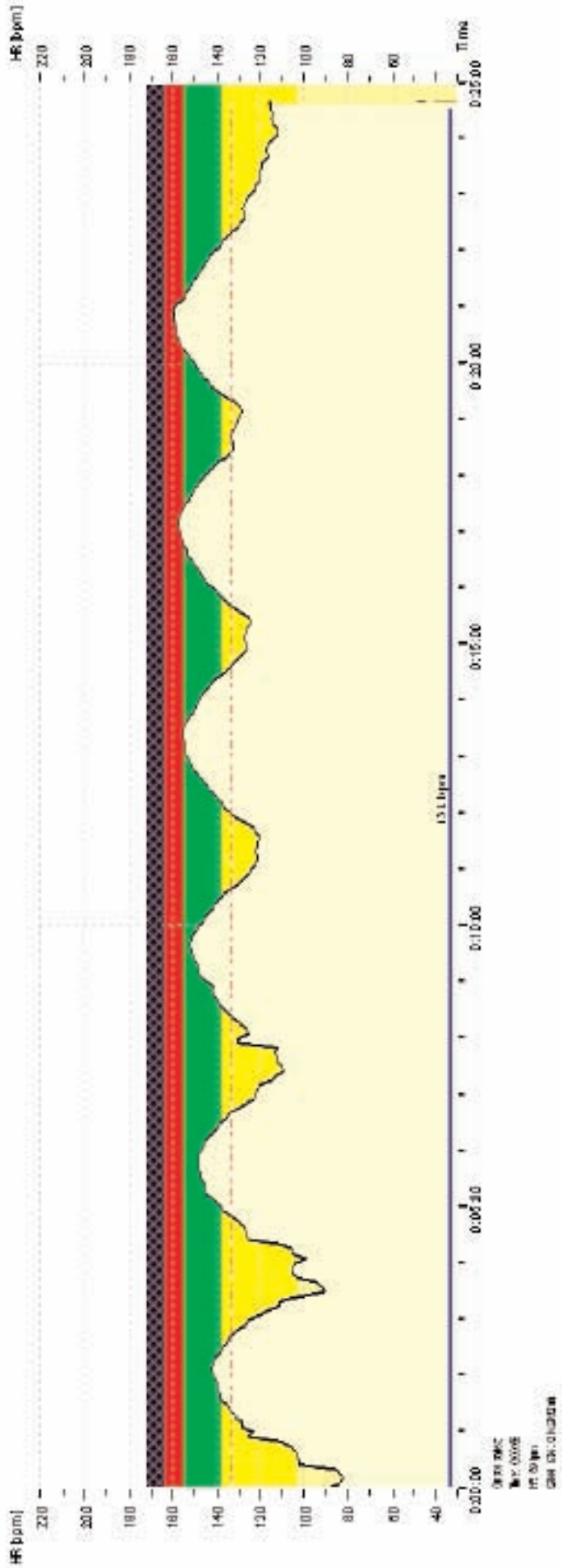
A simple example of this would be trying to run an interval session at 100% top speed for each run. The accumulation of lactic acid in the muscles would cause a premature ending to the session resulting in the cardiovascular system (stamina) not being stressed optimally.

Aerobic or Anaerobic Training?

There are many views on whether rugby players should train their aerobic or their anaerobic systems. Much confusion has arisen by thinking of these two energy systems as being totally separate that need to be trained as such. During games there is a high reliance on both, usually the anaerobic system tends to produce the majority of the energy when a player is highly active and the aerobic system is much more dominant during the many recovery periods, sometimes during ball in play time, sometimes not. During a game the heart rate graph is usually made up of many peaks and troughs. This can indicate reasonably well how, when the heart rate rapidly increases the player is usually involved in mainly anaerobic work and when the heart rate is either plateaued or dropping, the efficiency of the aerobic system will be dominant

The adaptive responses to high intensity aerobic training will increase mitochondrial and capillary density and aerobic enzymes and increase VO₂max. The result will be an increased capacity to perform prolonged exercise and quicker recovery from anaerobic and aerobic activity.

The Heart Rate Response of a typical Interval Session



Person: Peter Herbert	Date: 25/11/04	Heart Rate Average: 134bpm
Exercise: 25/1/2004 21.00	Time: 21.00:36	Heart Rate Max: 159bpm
Sport: Concept2	Duration: 0:24:39.1	
NOTE: 6 x 500m 2mr in 1.44.8's (7) home 33sr	Selection	0:00:0 - 0:24:35

KEY POINTS

- High-carbohydrate, pre-exercise meals improve exercise capacity.
- Carbohydrate-electrolyte drinks ingested during exercise are of benefit during competition and training.
- Fluid ingestion during prolonged exercise helps delay the deterioration in motor skills.
- Recovery is improved when carbohydrate is consumed immediately after prolonged exercise and at 1 hour intervals thereafter.
- During daily training or competition, recovery is likely to be improved when carbohydrate intake is increased to 10g per kg body weight each day.
- Rehydration is quickly achieved during recovery when athletes ingest fluids equivalent to at least 150% of the body weight lost during the exercise.

How do you know if you are eating too much?

If you eat too much you will put on fat!

Here are some simple guidelines to follow to ensure this does not happen

- Weigh and have your body fat measured regularly
- Record what foods you have eaten. This will indicate your true intake
- Be selective. Foods high in fat and sugar tend to taste better!
- Limit your alcohol intake
- If you are increasing your body fat but eating healthily, your food portions are too big.
- Too much carbohydrate will be stored as fat. Are you training enough to use up those carbs?

How much protein?

Athletes spend millions of pounds annually on protein powders, protein bars, protein shakes, and numerous types of amino acid supplements, all with the belief that they need massive amounts of protein to use as fuel for exercise and to help build proteins in muscles. It is argued by the supplement manufacturers that only high-quality proteins can provide optimal muscle growth or that only amino acids are absorbed into the blood quickly enough to maximally stimulate protein build up in muscles.

As is often the case in the dietary supplements industry, there is an ounce of truth and a ton of nonsense in these claims.

Here are some facts about protein needs and protein supplements:

- If you are unable to provide yourself with enough protein eating traditional meals then consider supplementing with protein drinks.
- If you do consume more protein than you need it will not be absorbed by the body and will go straight through the system (an expensive visit to the toilet).

Rugby players often need more protein in their diets than do inactive people. Except for a few athletes, the amount needed each day 1.2-1.6 grams of protein per kilogram of body weight (160gm for a 100kg player) is still very small. Moreover, this amount of protein can almost always be obtained from ordinary foods in the athlete's normal diet, without resorting to expensive protein supplements.

The maximal amount of protein required for rugby players probably does not exceed 2.5 grams of protein per kilogram of body weight every day.

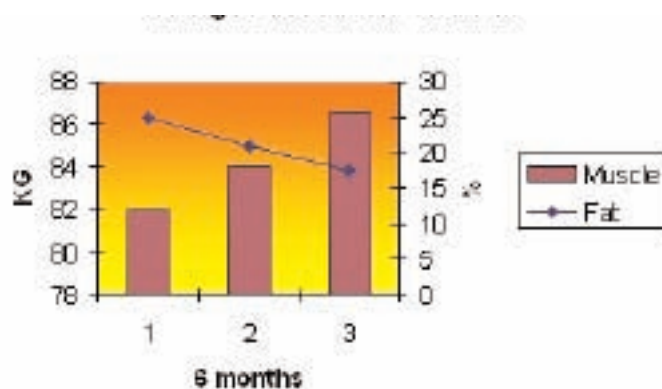
So, how can you choose ordinary foods that are high in protein? You can check the nutrition labels on the foods you are considering to get a good idea of how much protein will be contained in each serving. For example, a can of tuna packed in spring water contains about 2.5 servings of tuna when drained of water. Each serving contains about 13 grams of protein, so by eating the entire can of tuna, an athlete could consume $13 \times 2.5 = 32.5$ grams of protein. A large chicken breast will supply 72grams of protein.

BODY COMPOSITION

Lowering body fat will mean you can run further and get less tired

Lowering body fat will improve your acceleration, agility and speed

The following graph displays the changes in body composition over 18 months of a Llanelli Scarlets player. He effected this change in his body composition by modifying his diet and increasing the volume of his aerobic training and following a structured weight training programme.



Fat Mass and Performance

The relationship between the amount of body fat and athletic fitness varies depending on the sport. Runners (and rugby is a running game) must try to minimise their % body fat. Fat must be regarded as 'dead weight'. It requires energy to move it but does not increase the body's power output. This means that a runner will go further with each running stride with less fat.

From a scientific perspective, there is an inverse relationship between fat mass and performance of physical activities requiring vertical or horizontal movement (the higher the fat the lower the performance). Because acceleration is proportional to force, but inversely proportional to mass, excess fat will result in slower changes to velocity and direction. Fat also increases the metabolic cost of physical activity, so if you have too much fat it will lower your physiological output as the game progresses. Put simply, you will tire sooner!

Overweight players

If a player is grossly over weight and is having difficulty in shedding those unwanted pounds then he might need to consider extra training. If his clubs' training programme does not contain the volume of training time that enables enough calories to be used to cause a fat loss, then a reduction in food consumption is necessary. If this fat loss needs to be accelerated then extra training needs to be prescribed to the player. This is where the Concept2 indoor Rower will help.

The games player's season consists of pre-season, the regular season and post-season, followed by a four to six week transition period. The transition period is the time for complete mental and physical relaxation and can include holidays. A minimum level of activity should be maintained. This is time for reflection on the past season and to set goals for the next season. Pre-season should focus on developing strength and endurance, the baseline of physical performance. This also provides a chance to develop team cohesion. During the regular season, where two or more games a week are played, this will meet all the requirements of specific training. Non-specific training should involve immediate post-game blood washout to remove any muscle debris and allow meaningful training to resume as soon as possible. Continued focus on aerobic capacity and strength training should form the major part of the programme (90%), with the remaining 10% focusing on high intensity speed training. If there is only one competitive game per week one training session should involve game situation practices.

End-of-Season

This period can vary from 2 to 4 weeks and is the time when a well-earned holiday can be taken. The emphasis should be on relaxation and leisure, recreational activity.

Off-Season

This phase of the yearly training programme lasts for approximately four weeks. Training for this time of the year has primarily 4 broad objectives. These are to:

- Increase lean body mass and general strength
- Improve sprint and running technique
- Establish a modest improvement in aerobic capacity, by running activities and cross training.
- Allow lengthy rest periods between sessions

It is a time for players to concentrate on weaker areas of their fitness.. For example, players who are considered to be carrying excess body fat and/or having a relatively lower level of endurance fitness will be required to commence an aerobic running and rowing programme at an earlier stage than their leaner counterparts. Conversely, players who need to increase their muscle mass further will be prescribed an appropriate weight training programme and will not be required to commence their aerobic running until later in the programme.

By the completion of this phase each player will have effectively established a foundation allowing for the effective implementation of the more intense training programme associated with the next phase.

General Pre-Season

On return to their clubs players can be tested to assess their levels of fitness and identify areas that need extra work. It is this pre-season period that players can train specifically for three to four days a week and have ample time off for recovery and low intensity exercise which will encourage optimal fitness improvements. A popular method of training used during this early pre season phase is to programme hard and easy days. There could be two sessions a day, general stamina work in the morning followed by weights in the afternoon. The next day could include low intensity long duration rowing. This will give the body time to recover from the previous days training and also recuperate sufficiently to cope with the next hard session the following day. If this programme is worked on Monday's, Wednesday's and Friday's with two consecutive days of recovery on the weekend considerable advances can be achieved. Players will arrive for the Monday morning sessions feeling fresh and raring to go!

Specific Pre-Season

The final four to five weeks of pre-season will need to include more technical and rugby related work with the rugby coaches. Because of this there will be a need to lower the volume of work but of a higher intensity. Rowing at high intensity will provide an excellent anaerobic workout for all players.

In Season

Contrary to some opinions it is possible to improve overall fitness during the season. Providing coaches can provide the stimulus needed by periodising the training into 'macrocycles' (e.g. the year divided into blocks of over 5 – 6weeks) the energy systems will react more positively to a change in bias of training.

A microcycle can be a one-week training plan. There will generally be a set pattern to this which will revolve around game days. It is necessary for coaches to be flexible and smart and recognise that all players might not require the same training. Some will carry injuries, later in the season some might benefit psychologically by rowing or some other form of cross training.

In-Season it is possible to:

- Maintain and improve fitness achieved during previous phases
- Modify fitness training and skill training to incorporate recovery for each game
- Work in training macrocycles
- Make efforts not to overplay

Over the season whatever the permutation of training the end result will depend on; the specificity of the training to rugby, the level of intensity and the optimal level of

recovery provided. It might seem complicated but by measuring and assessing fitness levels regularly and using common sense, improvements will be made.



SECTION 12: Getting It Right On The Day

You can be the fittest you've ever been; know all the moves inside out; have the determination and attitude that will leave opponents far behind; practiced your skills until they are honed to perfection ----- and still get it wrong on the day.

In order for all the good qualities mentioned to pay dividends, players and coaches need to be clever and knowledgeable in ensuring nothing will get in the way of optimal performance. Months of diligent and demanding training can be undone by final game preparations being less than perfect.

- The Warm Up. This is can be divided into two sections, stretching and general body warm-up. Take a typical Saturday afternoon scenario. Players arrive at the ground at 1pm for a 2.30pm kick-off. The first 20 minutes could be used to get a 'feel' of the conditions.
- Walking on the field to check the condition of the pitch. This will dictate the length of stud to be used. Dry pitches with little grass might mean 'mouldies'. Muddy pitches will almost certainly mean the longest studs you can legally use.
- If you are playing away from home check the slopes that might not be so obvious at first sight. How deep is the in-goal area? Those responsible for restarts, is there a dry, harder piece of ground near the centre spot for the best drop kick.
- Check the angle of the sun and where it might have moved to in the second half.
- Which direction is the wind coming from? Have you checked the weather forecast to see if it will increase or die out? Most players prefer to play against the elements in the first half. Psychologically this can be good. If you are winning or just losing at half time you should feel confident of the next forty minutes. What can be soul destroying is to start the second half losing and still having to face the elements.
- What's the temperature? If you are a well-conditioned player, are a back and have low body fat you could be a prime candidate for mild hypothermia on the coldest winter days. Playing a game with the air temperature between 0' and 5'C with a wind of 20 mph can give a wind chill equivalent temperature of -15'C! Add some rain to that and you will definitely not be able to perform as well as you should. Responses will be slowed, muscle will have become cold and speed will be affected. So what can be done to improve the situation?
- Wear a thermal vest under your shirt. They have amazing heat retention qualities and will transport any sweat that might occur away from the skin and lessen the chances of heat loss. They are thin, weigh only a few grams and will keep you warm. (These can be purchased from most outdoor activity shops, the Helli Hansen long sleeved cost about £25)
- Two pairs of socks, and thin lycra cycle type shorts down to the knee will help muscles to keep warm and work more efficiently. Some players wear gloves. It is rare for forwards to suffer with exposure to the cold because of the higher running demands and scrummaging.
- Once in the changing rooms players can start their own stretching routines prior to the more organised routine practiced by most clubs. If they feel the need to get on the field earlier than the team to do some easy running this should be encouraged. It is important at this stage that players are psychologically happy with there own preparation. Keeping warm in the warm up is essential and all players should wear a tracksuit. Rugby shirts can be put on when returning to the changing rooms just prior to kick off.
- Many of the top clubs will go out to the field an hour before kick off. The warm up will usually commence with jogging for a few minutes to raise muscle temperature before stretching. The running will gradually increase in tempo with ball drills and set piece practices interspersed with further stretching. If it is very cold or raining heavily more of the stretching work can be done inside. The final minutes of the warm up should include short, flat out sprints with lots of directional and speed changes. This should be short, but demanding. The aim is to increase the work output to somewhere near that expected at the start of the game. By doing this you will help to avoid that feeling of breathlessness that often comes before the 'second wind' is reached. These sprints should be done as close to the game start as is practicable. Usually clubs complete this warm up with ten minutes to go to kick off.
- Half Time - Many clubs now have an extended half time period. This was initially introduced to accommodate television coverage and now seems to be the norm for all of the top clubs.
- If it's muddy and wet try to have a change of kit. Wet kit can weigh up to 10lbs.
- Sit down and relax for the first half of the break. Regularly move the legs to encourage the removal of lactic acid accumulation. Take in energy drinks or water or small, easily digestible food, such as bananas
- Three or four minutes before returning to the field, stand up and do some light stretching and leg movements such as running on the spot. In all warm up exercises it is important to expend the minimum amount of energy

that will adequately prepare you for action. An over zealous warm up can take away energy needed for the game. Too little and you will not perform at your best. (The fitter you are the harder you can afford to work at your warm up).

- Time your return to the field accurately. The last thing you want is to be on the field in the freezing rain waiting for the opposition.
- After the Game - All players should eat within 45 minutes of finishing the game. It is in this period that carbohydrates are most easily absorbed. This is called muscle glycogen resynthesis. It is advisable to perform some form of warm down following strenuous exercise. This can include easy jogging and light stretching for

10–15 minutes. Often this is difficult because of fatigue, weather or mind state. If it is not possible to do a complete warm down, light stretching in the changing room should be performed.





VERMONT HOUSE, NOTTINGHAM SOUTH & WILFORD INDUSTRIAL ESTATE, RUDDINGTON LANE, NOTTINGHAM, NG11 7HQ

TEL : 0115 945 5522 • E-MAIL : INFO@CONCEPT2.CO.UK • WWW.CONCEPT2.CO.UK