Section 6 :

Cross-Training

Introduction

When Concept 2 created the first rowing machine it was made for and used primarily by rowers. More recently indoor rowing has become a sport in its own right and the Indoor Rower has become a valuable tool for people wishing to add variety to their training for other sports. This section of the training guide gives an outline of how indoor rowing can benefit other sports.

Specific training is practising your sport while cross-training is when you add non-specific activities into your training regime. In this section we explain the principles to apply in order to develop a useful cross-training programme.

Firstly, what are the benefits of cross-training? Many sports use isolated muscles that lead to structural imbalance. Perhaps the clearest examples of this are games like squash and tennis. Here the racquet is held in one hand and the repeated action of hitting the ball develops the arm, shoulder and hand on one side. This causes the body to become unbalanced which in turn will limit the progress of the player. By developing the non-playing side of the body the balance will be restored and then further progress can be achieved. However, trying to restore the muscle balance by a right-handed player playing left handed would be a very inefficient method and so a different approach is needed.

By analysing the muscles used in the game, considering the range of movement, speed of contraction and loading, alternative exercises can be developed to restore balance.

All sports are a combination of skill and physical effort. Rowing is a closed skill sport, which means it requires the rower to learn one simple sequence of movements. The skill level is further reduced on the rowing machine where the issues of balance and oar control are removed. The fact that this movement has to be repeated continuously over a period of time requires a great deal of physical effort.

Team sports like rugby and football require a high degree of coordination between the players who all have a specific role to play within the team. During a game they are faced with a constantly changing set of circumstances and these require hours of practice drills. Although these games require a high degree of physical condition, the success of the team will depend on the level of coordination, which can take years to develop.

Because indoor rowing is predominantly a physical activity it has developed as a very efficient cross-training method. Below are some of the benefits of using the Indoor Rower to complement and enhance your training:

- 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.
- It offers all weather training to cope with times when conditions prohibit outdoor activities.
- It is weight-bearing and non-jarring and so can be a safe and effective way of training whilst recovering from illness or injury.
- Positive reinforcement can be gained by tracking improvement via the Performance Monitor.
- It is transportable, so can be used either at home or at other locations.

Cross-Training on the Concept 2 DYNO

In 1999 Concept 2 brought out the DYNO, a strength-training machine. By using the same principles of air resistance as the rowing machine, but with a modified fan arrangement, a much greater load can be developed. The advantage of this machine is that with no fixed weight a load of 1000kgs can be developed on a machine weighing only 50kgs. Because the load is dependent on the force developed by the user it is a very safe method of strength training. The load varies with the force applied so it mirrors the varying force that muscles are able to develop over their range of contraction. Despite many advantages of the DYNO over traditional strength training systems it has its critics. The main criticism is that there is no eccentric component to the exercise. Whilst this is true this would only be relevant if the DYNO replaced all other forms of exercise.

Muscles cannot push, they can only pull (shorten), and this action is known as a concentric contraction. There are two long strand proteins called actin and myosin arranged in bands along the length of the muscle fibre. On receipt of an electrical stimulus from the brain a chemical reaction takes place called the actomyosin complex that requires ATP to supply the energy for contraction. A bridge is formed and the actin glides over the myosin, which has a series of tentacles that draw the actin along. These are microscopic movements individually but repeated over the length of the muscle fibre combine to move a limb over its full range. Muscles can be used in two other ways; contraction without shortening is called static or isometric contraction (i.e. holding something still), and contraction whilst lengthening is called eccentric contraction. Which of these three options are used will depend on the task but the actomyosin process is common to all three, the difference is a neurological function.

Muscles are made up of a number of fibres and for any task only a relatively small proportion of the total number of fibres are recruited at any one time. If we consider a situation where you are lowering an object, while you are holding the load still the muscles are neither shortening nor lengthening. There is a balance between the number of fibres and the load, creating a static situation. To lower the object some of the fibres are switched off so that those still working cannot stop the muscle lengthening. This process has created an eccentric contraction, that is, the muscle is lengthening while under contraction.

The development of the neurological element is a vital ingredient in the preparation of an athlete and so eccentric as well concentric exercise is essential. Eccentric use of the muscle occurs for example in ball games where the athlete has to stop suddenly and change direction and also when landing in jumping events. Static, eccentric or concentric contractions are functions of the muscle and because of the sport specific nature of these functions it is best done whilst practising the sport and specific sport drills.

Strength on the other hand is determined by the cross sectional area of the muscle fibre and is a limiting factor of the loads that can be tolerated during the muscle functions. Rapid strength gains can be achieved through eccentric training but the majority of muscle damage is done during eccentric exercise. Therefore the safest way to increase the cross sectional area of the muscle fibre is by progressive overload of the muscle in concentric contractions. This is only one aspect of training and greater strength alone will not necessarily improve performance. Acquired strength has to be developed into greater speed and power in the context of the sport you are training for by using a comprehensive programme of exercises and practice.

Training the Energy Systems

Anaerobic Alactate Training

For athletes requiring instant power e.g. throwers, jumpers, sprinters (60m and 100m).

Development of the Anaerobic Alactate System

The exercise pattern should be a low number of hard strokes at a high stroke rate, interspersed with some light ones.

Example: 3 x (10/5 x 10) AN 32 to 36spm. Damper setting: 3 to 5

Row ten hard strokes at 34 strokes per minute followed by five light strokes repeated ten times, rest then repeat the whole process twice more, giving a total of 300 hard strokes. During the hard stroke phase, the heart rate will soar but, unlike during longer intervals, there will be no lactic acid accumulation. Progression would lead up to 3 x (17/7 x 10), AN 32 to 36 spm.

Anaerobic Training

For games players and 400m runners.

Development of Explosive Power

The exercise pattern should be a series of high intensity intervals of 30 to 60 seconds duration. Work to rest ratio 1:2.

Example: 2 x (45 secs/90 secs x 8) AN 32 spm. Damper setting: 8 to 10

Row 45 seconds maximum effort (this will cause high lactic acid levels) followed by 90 seconds of very light and relaxed rowing to allow the shunt mechanism to work. Repeat eight times, rest for five minutes, then repeat. Progression is indicated by improved power output measured on the monitor during hard strokes. Maintaining a higher output throughout the session indicates greater lactate tolerance.

Aerobic Training

For most sports, including those with low physical requirements e.g. bowls and curling.

Development of Endurance

For aerobic training the monitoring of output is vital. Heart rate is the simplest and most practical way to control work intensity as it increases with an increase in physical output. This is perhaps more important during long periods of aerobic training to ensure that you stay in the correct training band. Aerobic exercise intensity should be carried out at between 65 to 85% of MHR continuously for a duration of 20 to 90 minutes depending on the fitness level of the athlete. The damper setting/drag factor should be quite low, enabling the athlete to row with a flowing rhythm.

Blood Washout/Regeneration

For all sports, especially contact sports e.g. hockey, rugby, football and basketball.

Another excellent use of the machine is blood washout. After strenuous exercise, muscle damage and small lesions can occur, especially for those involved in contact sports. As a result, debris accumulates in the muscles leading to soreness and muscle stiffness. A period of low intensity rowing keeping the heart rate slightly elevated at 65% of maximum, increases the blood flow through the muscles. This not only speeds up the metabolisation of accumulated lactic acid but also carries away any debris, thereby aiding recovery.

Indoor Rowing for Games Players

The fitness levels of both football and rugby players has increased in direct proportion to the rewards in the game and so has the rate of injury and illness. It is quite normal in any squad for 25 to 30% of team members to be sidelined through illness or injury. One of the reasons for this is that very hard training suppresses the immune system which means that athletes are not only more vulnerable to picking up illnesses but will suffer from the symptoms more than a sedentary person whose immune system is under less physical stress. The second reason is as players get fitter they get faster, increasing impact speed and also operating muscles right on their limits. In addition to this, players are expected to be involved in more games, further increasing the risk of injury. Rugby and football players are bigger and heavier and these factors combine to shorten the player's career. 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. Professional football and rugby teams are businesses and any business that has 25 to 30% of its staff out of action has a serious problem.

In ball games, aerobic endurance underpins the entire performance. This is the ability of the heart and lungs to deliver oxygen to the working muscles and is known as aerobic capacity. A well developed aerobic capacity benefits games players in two ways; it ensures that the players can provide the required energy for the entire length of the game and also helps the body recover more quickly between bouts of intense activity. 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.

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.

The post season involves representative matches and the most important aspect is team cohesion and strategic planning. During this time the physical requirements will largely be met through drills but should still be supplemented with cross-training. This is especially useful for blood washout after competition plus alternate endurance and speed sessions on the rowing machine.

Good aerobic training should consist of 30 to 60 minutes at 70 to 85% of maximum heart rate, e.g. three times 20 minutes.

Threshold training should involve 25 to 40 minutes at 80 to 85% of maximum heart rate e.g. five times five minutes to five times eight minutes with two to four minutes rest between intervals.

Speed training should involve six to nine minutes of short bursts, at 95 to 100% of maximum heart rate e.g. six times 90 seconds or 12 times 45 seconds.

Indoor Rowing for Runners

by Andy Darling

Indoor rowing functions as a middle-ground meeting place for all sports. Heavyweight boxer Danny Williams is a keen enthusiast while World Championship silver medallist decathlete Dean Macey did 6:29.2 at the 1998 British Indoor Rowing Championship. At the 2001 British IRC, I spotted triathletes Sarah Springman and Sarah Coope, swimmer Adrian Moorhouse, and former rugby union stars Andy Ripley and Roger Uttley. In the men's 35-39 Lightweight event, meanwhile, 2:12 marathoner Andrew Green from Warrington completed the 2,000m in 6:47.5. Runners tend to be good at indoor rowing, and the activities complement each other astonishingly well.

George Meredith is something of a legend in the world of Indoor Rowing. At age 55 he has been winning his age category and setting records at the nationals, and medalling at the world championships since taking to the machine eight years ago. He also represents Scotland at cross-country running, has a 66:48 best for the half marathon, and a 2:26 for the full distance, set in the early 80s. His introduction to indoor rowing was via the typical runner's route: he was injured and in need of rehab.

'I was having trouble with my right knee and one of my toes' he says, 'and I was advised to incorporate indoor rowing into my training, so there would be less impact. It's definitely given me a second lease of life; my upper body's much stronger, and I wish I'd had it as part of my training earlier in my running career. I have no doubt that it helps when it comes to sprinting towards the end of a race.'

George's indoor rowing sessions are not dissimilar to his running workouts. The 2,000m distance, when raced, boils down to about 80% aerobic work, and 20% anaerobic. That ratio results in a fairly hellish degree of oxygen debt, hence James Cracknell's collapse after a time trial on the BBC's Gold Fever documentary series. To increase his ability to function when lactic acid is telling him otherwise, Meredith favours indoor rowing sessions such as three times 2,000 metres at close to race pace, with six minute rests between each. As with running training, these are done off the back of plenty of long, steady sessions that build up a sound aerobic base. Andy Millbank of Herne Hill Harriers does similar indoor rowing training, based around the knowledge he's gained from a quarter of a century of running. He has done a 3:53 on the track for 1,500 metres, a distance that requires a similar aerobic:anaerobic ratio to the 2,000m row, and like George Meredith and Andy Ripley, whose knees were shot after years of impact on the running track and rugby field, it was an injury that initially brought him to the rower.

'I ripped my hamstring years ago, so I've always tried to cross-train. A guy in my gym said he was doing the British IRC last year, so I had a go, applying the rep system from running. It's similar to running in that everything needs to be timed, all the splits.'

Anyone familiar with the Concept 2 Indoor Rower knows about the 500 metre split time on the performance monitor. Every stroke you take, it tells you how fast you're going, whether you're sticking to your intended times or flagging. People become obsessed: comparing their PB splits for single strokes on the Concept 2 message board, the equivalent of weight training's one rep max. At the other end of the scale, there are the Million Metre men, bashing out 1,000 kilometres in under seven days, and later complaining about no longer having any buttocks. Somewhere in the middle, there's the marathon. 42,195m on the erg requires far less in the way of pure strength, and runners manage to translate their huge aerobic fitness into some excellent times: when he was 50, George Meredith completed the distance in a UK age record of 2:46, which breaks down to 500 metre splits of 1:58.

The first time barrier for men on the Indoor Rower is completing 2,000m in less than seven minutes, for women the same being true of 7:30. And then there's the six minute barrier. On a par with running a sub 2:10 marathon, doing 2,000m before six revolutions of the second-hand are complete truly marks out the world class. No lightweight has ever done it, but a few heavyweights manage it each year: the 2001 Pinsent/Cracknell head to head at the British IRC took 5:47.5. Not too far behind, sneaking under the barrier by a second and a half, was Tony Larkman, a 33 year old former international water rower. After 20 years of high class rowing, this was the first time he'd broken six minutes. He credits the improvement not to extra hours on the erg, nor to long weight training sessions, but to running.

'I decided to enter the London Marathon in 2001 and retire from competitive rowing. I trained for the marathon and thought I'd enter the British IRC as part of my training to give my knees a rest. I completely gave up weight training in April 2001 and watched my weight go from 100kgs to 90kgs from running and cycling, plus using the ergo. I raced at the British IRC and recorded a personal best of 5:58.8, winning a silver. Obviously, I was overjoyed and praised my running for this PB, which was a complete surprise. As a rower who hated running, I've realised the significance running has placed on my cardiovascular system and the improvements I've gained. I understand that lighter smaller people may not receive the same benefits as I did, but for bigger people, running in my opinion definitely improves leg strength, cardiovascular fitness, and your anaerobic threshold. Because of running, I lost 10kgs and did well in my rowing boat as well - thanks running!

'I continued to run including hill sprints, cycling, indoor rowing and do the odd bit of rowing, and I won a gold in Boston at the World IRC (dead-heating with two other Britons). I now cross-train using the Indoor Rower, bike, and running. I find the whole combination, mixed with a variety of work sessions, aerobic and anaerobic, works with great benefits. I'm convinced the combination of the two plus cycling gives an athlete the ultimate return.'

Philip Healy would agree with Larkman, though at around 2/3 of the weight, he comes from the other end of the sporting spectrum.

'I used to run a lot at a decent level: 3:40 for 1,500 metres and 29:35 for 10km. Then I got injured and did little for several years. I then got introduced to the Indoor Rower, and trained on it for about five months with just the occasional easy run. I ran a five mile road race prior to the British IRC last year, and finished 3rd in 25:10 and then came second at the British IRC in 6:24, in the men's 30-35 lightweight category.

In a nutshell, indoor rowing, in my opinion, is, by a long way, the best exercise to complement running. During my running career I had frequent injuries and ran in the pool, or cycled but nothing gives you the type of fitness the Indoor Rower gives.'

I've also followed a similar trajectory to Healy, and am finding that my running, put into hibernation for a couple of years, is back to the reasonably high levels of half a decade ago. Undoubtedly this is due to training on the Indoor Rower, building up a good aerobic base via those long sessions, and then sharpening up with hard anaerobic efforts. Mortality permitting, the day will come when, cartilage-free, we all have to follow the example of nonagenarian John Hodgson, and train on the erg and nothing else. Until then, though, the future's bright for rowers who run, and runners who row.