THE MASTERS ATHLETE

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Carbohydrates Role in Sickness Prevention

By Dr Peter Reaburn
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Introduction

Summer is here and it's time to train. For many older athletes the Xmas period is also a chance to take a well-deserved holiday and cram in the miles. Unfortunately, many of us, including myself, still think we can bounce back like we used to as younger athletes. It doesn't happen. However, many of us keep pushing till we get sick. For most athletes, the first sign of sickness is an upper respiratory tract infection – affectionately known as URTI. Recent scientific evidence suggests that nutrition may play a crucial role in preventing URTI.

The Nutritional Supplements

Research has focussed on vitamin C, an amino acid called glutamine, and carbohydrate and their role in maintaining or boosting the immune system's response to prolonged or intense exercise.

Vitamin C

A recent South African study of ultramarathon runnershas demonstrated a strong association between vitamin C supplementation (600mg per day for 3 weeks) and fewer URTI symptoms. It must be noted that not all studies have shown such a positive response. However, for those of us in heavy training, it may be worth a try.

Glutamine

Glutamine (an amino) and glucose (from eating carbohydrates) are both important fuels for immune system cells called lymphocytes and monocytes. Lowering the availability of these fuels through intense or prolonged exercise lower the rate of immune system cell production, thus making us more susceptible to illness.

Carbohydrates

When we exercise hard or long or hard and long, we reduce the blood glucose levels. This has the effect of increasing the release of a couple of stress hormones, increasing growth hormone release, and decreasing blood inslulin levels. Together these hormones act to increase blood glucose levels through a number of mechanisms including using proteins to create glucose.

Research presented earlier this year strongly suggests that lowered blood glucose levels lowers the immune system response and makes us more susceptible to URTI. Figure 1 below shows this relationship.

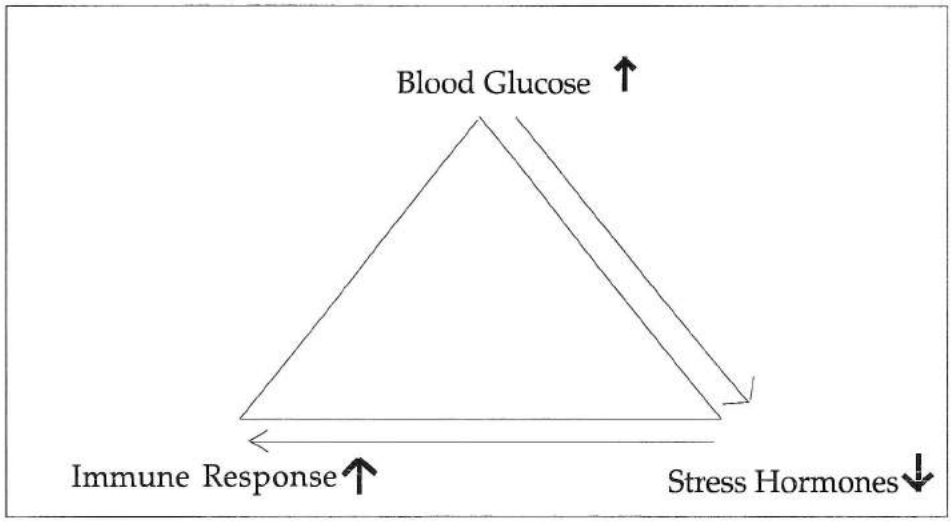

Figure 1: Relationship between blood glucose and immune system

This model strongly suggests that if we carbohydrate supplement (eat/drink) during endurance exercise or hard training / racing we can maintain or elevate blood glucose levels which prevent the release of the stress hormones which in turn counteract the negative immune system changes associated with URTI.

Two recent studies on runners and triathletes have strongly supported this suggestion. Both studies had the athletes running or running and cycling for 2.5 hrs at close to race pace. The athletes either drank a placebo (dummy fluid) or a carbohydrate drink.

The results of these studies showed that, in the carbo drinking condition, the athletes maintained blood glucose levels, reduced the stress hormone concentrations in their blood and most importantly reduced their immune system response, a good thing in terms of getting sick. These results strongly suggest that keeping blood glucose levels up in training or racing by eating or drinking is the way to go to try and hold off URTI.

The following guidelines for consumption of carbohydrate before, during and after exercise have recently been suggested by the *Gatorade Sports Science Institute.*

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Editorial

Hello everyone

It's that time again when you dedicated athletes spend all your holiday time craming in as much training as possible.

Congratulations to all those who competed at Noosa. I hope you were happy with your performance. I really enjoyed the format this year , particularly the criterium.

THE MASTERS ATHLETE is looking for a new owner. I've given three-and-a-half years to the publication. With two young children and two other jobs, it's time for a break. The February 1999 issue will be my last! If you are interested in taking it on, give us a call on 07 49265269AH.

Due to business closures over Christmas and the New Year , the Feb 99 issue will probably arrive late Feb early March.

Merry Christmas to all and the very best for 1999.

Claire Reaburn

This Issue..

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ENDURANCE

Go out Fast or Come Home Fast

© by Dr Peter Reaburn

How often do you see youngsters or inexperienced athletes at the start of an open water swim, triathlon or particularly fun run, go out hard then die? What is the best pacing strategy? Go hard and try and hold on or build the race? Very little has been written on the area of pacing so let's try and take a scientific look at the concept and see if we can come up with some answers.

The Physiology

Going out too hard at the start of a race leads to a rapid accumulation of lactic acid which has three negative consequences for racing:

- It stops muscles contracting properly thus slowing us down
- It slows down the breakdown of carbohydrate and thus energy supply
- It hurts. That is, the athletes that head out too hard, 'die' .

Going out slower in the earlier parts of a race reduces the amount of lactic acid produced and prevents the negatives above from slowing us down.

A slower start also allows the heart, lungs and blood vessels to get moving and deliver that all-important oxygen. The more oxygen, the less lactic acid. This allows the middle and latter stages of the race to be done at a faster rate.

Previous Research

Studies have compared the three possible pacing methods - the even-pacing, fast-slow and slow-fast (negative splitting) pacing. Research, although from the 50's and 60's, has shown that fast-slow pacing that the inexperienced youngsters use is the least effective method of racing. However, the research is relatively inconclusive as to whether even-paced or slow-fast pacing are the best way to go.

In 1993, a study from Wisconsin, USA, studied nine-well trained cyclists and came up with strong support for the slow-fast method of pacing in a 2-K time trial. The first one K was covered at 56, 53, 51, 50 and 48% of their best 2-K times. The final one-K was to be completed as fast as possible. The moderately-slow 51% method produced the best performance times and fastest second K. None of the nine cyclists performed well with the fast (48%) starting K.

What the elite use

Years of watching elite swimmers and runners has also revealed that most use the even or slow-fast slow pacing methods. While there are always exceptions in elite sport (eg. Perkins in the 1500 free or Thorpe's unbelievable speed at the backend of a 400 free), the fast-slow method has seldom proved successful in endurance sport.

In support of the even-paced and slow-fast methods we can learn a lot by looking at runners like Daniel Komen (WR for 5K - 12:39) or Paul Tergat (WR for 10K - 26:27). Komen ran the following 1K splits in his world-record run - 2:32, 2:32, 2:31, 2:31 and 2:31 (slow bastard eh!!). Tergat, on the other hand, used the slow (!?) - fast method of pacing in his world record 10K run. He ran 13:17 for the first 5K then came home in 13:10 for the final 5K, //////???? produced without any of the negative consequences outlined above

Once produced at the start of a race, the lactic acid seems 'to loiter with intent' and takes a long time to remove, even when we slow down.

A 1958 study looked at three strategies to run 1245 metres all-out. ê Á ∞-/ ∞‡=!∞† "∞† #ê† $ê† %∞ies to run 1245 metres as fast as possible. First run was started at 13.9 mph (remember miles?) and held that pace till the end - a time of 3min 20 secs. The second run was done starting at 13.5 mph and running at 14.9 mph till the finish - the same 3 min 20 sec time for the 1245 metre run. This run produced the least lactic acid and the lowest oxygen consumption. The third run was a disaster for the runners. They ran at 14.9 mph at the start and came home at 13.5 mph, the head out hard and die method!! Performances plummetted and both lactic levels and oxygen consumption skyrocketted.

How can I prevent 'dying' in a race?

Obviously a strong aerobic base, high aerobic capacity, anaerobic threshold and economical technique are crucial and have been discussed in previous issues of TMA. However, three strategies are crucial when preparing for and actually racing. Firstly, when preparing for racing, ensure you do goal pace training. That is, doing repeats in the pool, on the track, road or river, that are at the pace you want to race at. Secondly, on race day, warming up well before the race. An effective warm-up should include moderate pace work, above race pace work and race-pace work. I see far too many masters athletes cruising in warm-up or not warming up at all and wonder why they perform poorly. ????????

Thirdly, take the advice from the rese outlined above, even-pace or negative Give those muscles a chance to get the blood and oxygen in so they don't produce that acid that slows us down and makes us hurt. Try the advice and see which of the even-paced or negative splitting works for you. See you well-warmed up on the start line!

The Facts of Life

During the average human lifeyears, we will:

- Spend three-and-a-half years eating, including 7300 eggs and 160kg of chocolates
- Produce 40,000 litres of urine and spend more than six months on the loo
- Spend 12 years watching TV
- Talk on the phone for two and a half years
- Grow 28m of finger nails, 950km of hair on the head and 2cm up the nose
- Kiss for two weks
- Shed 19kg of dead skin
- Have sex 2,580 times with 5 different people
- Blink 415,000,000 times
- Walk 22,000kms
- Talk continuously for 12 years

Taken from the Central Qld University Student Association Newspaper "PSSST" Week 11 Winter Term 1998

The Team

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SWIMMING

The 'Dry Side' of Training

Staying in shape with limited time

© by Judy Meyer-Bonning

Carlile Swim School (Former USMS Masters Coach of the Year)

For most of us the "wet side" of training is well regimented. We attend regular swim sessions, schedule practice time and compete in meets with fairly rigid consistency. But not necessarily so for the "dry side" of training. This article takes a look at the many things you can do 'out of the water' to achieve peak performance.

One of the greatest obstacles that adults face when trying to maintain fitness is finding enough time in a busy schedule to train and recover properly before the next workout. If you did everything that all the books and articles on training recommended, you would never see your families, you would get six or less hours of sleep at night and you would probably be so stressed at work that your job performance would suffer greatly.

How to Achieve a Peak Performance

There are seven factors that affect peak performance; the goaf of an athlete is to try to have all seven come together at one perfect moment. Even adults with limited free time can make the most of these significant seven factors:

Genetics - Fortunately, or rather unfortunately for most, this is something over which you have no control. The only thing that you can do is to thank (or blame!) your parents, then accept the fate that has been bestowed upon you and try to deal with it as best you can.

Nutrition - Most educated adults already have a great deal of knowledge on this subject. Eating a low-fat, low-sugar and high-carbohydrate diet is one of the keys to success. (Note that I make no reference to Ding-Dongs, Ho-Ho's or Twinkies!) Eating properly will assist in weight control and fill the muscle cells with the much needed glycogen that is necessary when training. Hydration, which is accomplished best by drinking lots of water, is another important aspect of nutrition that is often neglected. There have been many great athletes who have trained diligently, only to blow their big event by not eating properly and allowing their muscles to be depleted of the necessary energy sources. This is important during the season, prior to the event and even on the race day. By eating properly you can maximise your time spent training.

Mental Activity - Sports psychology has come a long way in helping our athletes to perform at their best. Skills such as visualisation, relaxation and goal setting can be developed by the willing adult. Keeping proper mental focus is important throughout the season - not just on the day of the big event.

Training and Competition Aids - Today's swimmer is blessed with a multitude of training and competition aids which enhance performance, yet take no additional time to use. Swim fins, paddles, drag suits, goggles, pace clocks and pull buoys are just a few of these items. There have also been many items that have enhanced our competitive side as well. Fast pools, shaving down, waveless lane lines and pater suits are examples - use these to your advantage!

Drugs - These are not the drugs that are harmful, such as steroids. These are the drugs such as the moderate use of aspirin to prevent swilling, beta blockers that are used by some heart patients an medications that are necessary for some asthmatics. By using the necessary drugs properly, training can be enhanced. (Always check with your physician before taking any medication).

> "ONE OF THE GREATEST OBSTACLES THAT ADULTS FACE WHEN TRYING TO MAINTAIN FITNESS IS FINDING ENOUGH TIME IN A BUSY SCHEDULE TO TRAIN AND RECOVER PROPERLY BEFORE THE NEXT WORKOUT."

Chance - This is the luck of the draw. In an outdoor pool, it could be the weather conditions. These are things that you have no control over, so it is usually best to accept the circumstances and not waste time and energy fretting over them. Remember, the conditions are almost always the same for everyone. So relax!

Conditioning and Training - Learning how to make the most of your training is what is important for the young and old. Much time can be saved by using proper training techniques. Mega yardage is out, quality yardage is in!

A Moderate Lifestyle for Success

Stress is an inevitable part of living that can be reduced substantially by exercising moderation in our lifestyles. Your goal should be to balance work, sleep, diet, exercise and recreation/relaxation. If any one of these becomes too dominant, then serious problems will arise. Exercise should be a positive aspect of your life, not an additional source of stress. Overtraining can lead to many problems including martial stress, illness, depression, weight loss and fatigue. So it is important that we make the most of our training time, but do so with the proper degree of moderation.

Maximise Your Training

In addition to the actual swimming, a number of other activities can help maximise your training. Most of these activities can be done in just a few minutes each day or even every other day.

Stretching Exercises

Stretching is definitely one of the most neglected components of adult exercise routines. And for the competitive swimmer, these exercises are even more important! The lack of flexibility will cause stroke defects and inefficient stroke mechanics. For example, few people realise that the lack of ankle flexibility is the primary reason that most adults have extremely poor kicking abilities. Triathletes and runners have the most difficulty with inflexible ankles. A good stretching routine will;

a. Enhance stroke mechanics;
b. Allow maximum use of strength;
c. Enable the body to be more effective and efficient;
d. Prevent joint problems, bursitis and back problems;
e. Help body balance;
f. Reduce injuries.

There are many, many different types of stretching exercises. The important point to remember is to establish some type of routine, even if it is only for five or ten minutes per day. Do not set yourself up for failure by trying to do too much or by omitting your stretching altogether. Many books and articles instruct everyone to stretch for 30 minutes to one hour per day. Realistically, who has time for that?

It is important to find a time that is best for you. It should be a time of day when you will have the fewest interruptions and a time that will hopefully develop into a regular routine. Some people stretch while they are watching the evening news or reading the paper. Some find time to stretch while at the office or at home talking on the phone. The ideal time to stretch is before and after you swim. Stretching in the pool after the muscles have warmed up with some easy swimming is very beneficial. It is easy to stretch while waiting in between sets or while socialising. In the jacuzzi after the work-out is also a great time to stretch. By using the walls of the pool or by using a partner, there are many great flexibility exercises they you can do on land or in the water. If possible, try to talk your teammates into meeting before or after practices on a regular basis to stretch. It's a great way to socialise as well as increase your flexibility.

Abdominal Exercises

The abdominal muscles are consistently used in swimming, especially when executing turns. To use them most effectively in the water, we must develop them 'on land'. there are many , many good abdominal exercises, such as crunches with the legs in various positions, v-seats, twisters, side crunches, single leg lifts, flutter kicks, etc. An adult swimmer can do several sets of stomach exercises in only two to three minutes per day that will improve abdominal strength. Select several different abdominal exercises and perform up to 25 rep-

Continued on page 7

SPORTS NUTRITION

Evaluating those Performance-Enhancing Supplements

© by Dr Peter Reaburn

"Improves your performance by 10%", "Rapid Energy Enhancer", "Provides Stamina" etc etc. We've all read the glossy brochures and had the ads jump out at us from the popular magazines. But how can we evaluate what the marketeers push at us. Do we trust them, are they lying or are they just bending the truth a little?

The purpose of this paper is to save us some money by giving us the ability to read the marketing blurbs or the claims on packaging and make an informed decision.

The Problem

Three issues surround the performance-enhancing (ergogenic) products:

1. The number of products and outrageous claims.
2. Lack of control in the advertising industry.
3. The consumer's naivete and possible distrust of science.

The product's claims

Pick up any sporting magazine and open the pages. In 1993 a group of researchers evaluated 624 commercially available products for body builders and found 800 claims of improved performance, most of them totally unproven by any scientific research.

Lack of control in advertising

The ads we see are glossy, full of scientific claims and testimonials and often carry a picture of a high-performance athlete. The American Dietetic Association estimated that Americans spend at least $10 billion on what they call "quackery". However, the following tactics are often used by advertisers:

- *Research findings are taken out of context.* For example, creatine monohydrate HAS been shown to improve repeated **sprint** ability by 5% yet the marketeers are pushing it towards **endurance** athletes with claims that 1500m swim times can also be improved by 5%.
- *Conclusions are extrapolated.* For example, rat or cat studies have been done and the results related to athletes.
- *Results are applied in an unproven manner.* For example, vitamin supplementation has been shown to benefit those with vitamin deficiencies. However, no benefits have been proven in those athletes with a well-balanced diet.
- *Claims of University testing.* At best many of these studies may have been done with poor research design (no control group, lack of a placebo, no cross-over) or at worst not done at all.
- *Lies are told.* Often the research is not available for public viewing, is taken from unverifiable sources, or is not from what we sport scientists call peer-reviewed journals.

> "In 1993 a group of researchers evaluated 624 commercially available products for body builders and found 800 claims of improved performance, most of them totally unproven by any scientific research."

The sooner consumer affairs groups lobby the government, the sooner we'll all stop being ripped off.

The public's scientific naivete

The general public do not have the scientific knowledge and thus ability to read a label and make an informed decision. They rely on the "honesty" of advertising, assuming that the advert industry is ethical and honest and will give us the facts in plain language.

Solutions

Combating of evaluating misinformation requires a number of steps:

1. Ask or read informed sources. Sport scientists, sports physicians, sports dietitians often write in popular magazines, appear at seminars and conferences. The leaders in their field stay in touch with the scientific journals are generally widely read and have the skills and knowledge to evaluate claims from ergogenic aid producers.
2. Evaluate the supporting evidence. Testimonials from elite athletes may be clouded by the dollars paid to that athlete, their position on a board or the fact that the product that works for them may not work for another athlete. Research claiming miraculous cures or improvements may have been funded by a commercial company and the results therefore clouded. As I write I'm looking at a brochure for product x that has supporting evidence from three books written by an MD with a Russian name. Not a well-recognised peer-reviewed journal or well known scientist.
3. If the claims are "too good to be true", they probably are.
4. Visit a dietitian, ideally a sports dietitian who is trained in this area.

Conclusion

While I remain a sceptic regarding most supplements claims, I do believe that many athletes diets are inadequate and that many overtrain and may need these supplements. I am also a strong adherer to the belief that if a athlete *thinks* something is working for them, then they should stick with it. However, I urge you to talk to informed sources, listen to or ask experts, and read from scientific literature or reputable authors in popular literature. Finally, as stated above, if the claims are too good to be true they probably are!! Spend wisely.

From the Research

Fluid Intakes and Losses in Swimmers

While fluid loss in runners and cyclists has been extensively researched, very little research has examined fluid loss in swimmers. AIS researchers recently collected data from 41 swimmers (20F, 21M) on the Ozzie National Swim Team. Specifically, they measured fluid loss (via body mass changes) and voluntary fluid intake over 13 training sessions. The results were expressed in millilitres of fluid per kilometre of distance swum. The male swimmers sweat rate was 138ml/km and voluntary fluid intake 155ml/km. For female swimmers the sweat rate was 107ml/km and voluntary fluid intake 95ml/km. The authors found very large variations in each swimmers' fluid intake and fluid loss. However, the results do suggest that male swimmers lose more fluids than females and that swimmers, at least elite level swimmers, lose less fluid than "land-based" swimmers.

Editor's note: The swimmers in this study were elite and well-educated as to the need for fluid intake. Most swimmers, particularly masters swimmers, do not appear to be as well-educated or to take fluid loss seriously in training.

Cox, G., Burke, L., Broad, E. & Riley, M. (1998). *Body mass changes and voluntary fluid intakes of elite level swimmers.* Proceedings of the Australian Conference of Science and Medicine in Sport, Adelaide, October.

CURRENT RESEARCH

Tri Glycerol loading to beat Dehydration

© by Aaron Coutts MHMSc

Triathlon Research Initiative Central Queensland University

Fluid replacement is critical for triathlon performance, especially in hot and/or humid conditions such as Noosa of Hawaii triathlons. In triathlon, dehydration becomes particularly troublesome as fluid replacement is impractical during the swim leg and often it is several kilometres in to the cycle leg until fluid is taken.

Research has shown that small body mass losses as low 1.8% of body mass through dehydration can reduce endurance performance. Such levels are commonly observed in triathlon. Therefore, maximising fluids levels prior to racing is important for optimal performance. Recently, "*hyperhydration*" or "*fluid loading*" before endurance events has been suggested by sports scientists to delay the negative effects of dehydration. Recent studies have shown that the ingestion of a glycerol solution can be used to induce hyperhydration and thereby delay dehydration during racing and therefore improve performance.

What is glycerol?

Glycerol is a clear, sweet, syrupy liquid that will increase fluid retention. It is found naturally in many foods and when eaten it is rapidly absorbed and distributed evenly throughout the body. Generally, when taken orally and diluted in a fluid solution such as sports drinks, glycerol is considered to be free from side effects.

What does it do?

Hyperhydration or fluid retention induced by drinking glycerol solutions has shown positive effects such as expanded plasma volume, lower heart rate, lower body temperature and an increased sweat response which may lead to an improved performance in triathlons.

Glycerol loading can increase our ability to retain water by around 50 percent. Research has shown that glycerol increases body water content to between 0.3 to 0.7 litres greater than typical sports drinks. The suggested reason the increase total body water following glycerol loading is a decreased urine output which is produced by the action of glycerol on the renal system and its regulatory hormones. Interestingly, common sports drinks have a different effect on the kidney and their hormones. Hyperhydration with sports drinks decreases the concentration in one of these hormones which increases urine output. It is this property of sports drinks that do not make them as effective hyperhydrating agents as glycerol.

Another advantage of glycerol loading is that it has osmotic properties which allows even distribution in spaces between and within your body's tissues. For example, during loading fluid is moved from your blood plasma and stored outside these vessels which prevents filtration by the kidneys and therefore reduces urine output. During exercise when dehydration occurs through sweating, this fluid can be transferred back to blood which defends the loss of blood plasma. This action assists in the maintenance of blood pumped around your body and therefore maintains oxygen delivery to your exercising muscles which may assist your performance.

In essence, the body handles the heat better with hyperhydration because there is more water available for internal cooling. This allows you to exercise at higher intensity in the heat. Therefore glycerol loading can lead to improved triathlon performance in hot and humid conditions.

A study recently completed at Central Queensland University found that glycerol loading improved Olympic distance triathlon performance in extremely hot and humid conditions. This research found that glycerol loading decreased urine ouput, increased plasma volume and improved Olympic distance triathlon performance. However, as with any research, more work needs to be done to provide definitive results.

> "RECENT STUDIES HAVE SHOWN THAT THE INGESTION OF A GLYCEROL SOLUTION CAN BE USED TO INDUCE HYPERHYDRATION AND THEREBY DELAY DEHYDRATION DURING RACING AND THEREFORE IMPROVE PERFORMANCE."

Problems with glycerol loading?

Most athletes will not suffer any side effects from the ingestion of a glycerol solution, but the potential side effects. Some the these include:

- mild bloating
- light-headedness
- headaches
- dizziness
- nausea
- vomiting

Taken as directed, glycerol appears safe. However, pregnant women and people with high blood pressure, diabetes or kidney problems should consult their doctor before using glycerol. I failed to find any negative side effects in a recent study that looked at glycerol loading on Olympic distance triathlon. However, as with any new performance drink or supplement, give it a few tries on training runs before you use it in a race.

How much do I need to drink?

Although there are a number of methods used to glycerol load, the most common method involves drinking a relatively large volume of solution about 2 hours before you compete. I would recommend you use a solution mixing 1.0 - 1.2 grams of glycerol per kilogram of your body mass with 20 - 25 millilitres of water or half strength sports drink per kilogram of your body mass. Therefore, a 70-kilogram person would be required to consume about 1.75 litres of fluid.

However, when you are first trialing glycerol, you may want to start with a more diluted solution, for example: 25 millilitres of water per kilogram of body mass for one gram of glycerol per kilogram of body mass. This will require you to drink a large volume of fluid so please practice this before you use it in competition. You should drink the glycerol solution in the last 2 hours before the start of the race or training. Try to allow an hour between finishing your glycerol solution and race/training as sometimes the large quantity of fluid in your stomach can cause a bloated feeling in your stomach.

Where do I get it?

So far there are no sports drinks that contain glycerol in Australia, but is now commercialised in the USA under the name Glycerate™. In Australia glycerol can be purchased over the counter in any chemist or supermarket in as glycerine (pure glycerol).

Practical advice

Trialing glycerol hyperhydration during training is highly recommended. Some athletes have found the sweet taste of glycerol to be quite distracting. Therefore, trial with your mix before you use it competition. Furthermore, research suggests that it is unlikely that drinking glycerol solutions during exercise will promote improvements in cardiovascular or thermoregulatory functions. This is due to the fact that glycerol ingestion during exercise does not allow time for the glycerol to be distributed throughout the body fluid compartments. It is better to drink a sports drink that will provide you with water and a convenient energy source during the race.

Conclusion

As the summer months approach, coaches and triathletes need to be aware of the dangers of training and competing in the heat and develop a hydration plan to combat the obstacles that heat presents. Our research suggests that glycerol loading should decrease race time. However, the jury in the sports science community is still undecided about the performance benefits of glycerol loading. My personal opinion is that if the consumption of large volumes of fluid do not bother you, that it has definite potential as a performance enhancer in hot and humid conditions. I suggest you TRI it in training and make up your own mind.

ROWING

Training for Speed

© by Tim Kerrison (Q'ld Academy of Sport)

Speed is, of course, essential to rowing successfully. But how and when should speed be developed within a structured training program? Many masters rowers seem to over-emphasise speed and neglect other aspects of training which are fundamental to racing fast, while, at the other end of the spectrum, it is easy to get carried away in developing an aerobic base and perfecting technique but neglect speed training. So what is the perfect balance?

Think about a training program as a pyramid; one phase of training lays the foundations for the next phase of training with the pinnacle of the pyramid being the attainment of racing condition. In this structure, speed training can be thought of as the final layer of that pyramid, just before you are required to race. But before we can undertake specific speed training we must prepare our bodies. The body must be primed physiologically, biomechanically and neuromuscularly before we can effectively undertake speed training.

> "THE BODY MUST BE PRIMED PHYSIOLOGICALLY, BIOMECHANICALLY AND NEUROMUSCULARLY BEFORE WE CAN EFFECTIVELY UNDERTAKE SPEED TRAINING."

Before you can maintain your race speed for a sustained period, you must be physiologically prepared. That is, even if you can row exceptionally fast for 15 strokes, you must have the physiological development to sustain that speed for the duration of the race. Similarly, you need good physiological condition before you can effectively train speed. For example, poor aerobic condition or a low anaerobic threshold will greatly increase the time necessary to recover between repeated sprints, due to greater lactate production and poorer removal during high intensity exercise.

I always encourage athletes to explore ways to make training as specific to racing as possible. For example, anaerobic threshold training can actually be done close to race speed if you structure the training set such that the intensity modulates from above threshold to below threshold. For example, a set of 20 x 60 seconds, with 60 seconds recovery, could be completed at 90% of race pace, without lactic acid accumulating throughout the set. This type of training set challenges the body to work efficiently and remove lactic acid from the muscles. So without being a particularly fatiguing session, you can still do 20 minutes of near-race-pace work. Note that an athlete without a good aerobic base will not be able to complete this set without accumulating lactic acid and fatiguing.

Neuromuscular qualities include the motor patterns required to row at the rating and intensity necessary to achieve fast boat speed, as well as muscular qualities such as strength and power. Doing many hours of endurance training may be beneficial physiologically, but what does it do to our ability to row at race pace? Most good training programs include a speed thread throughout the program to maintain the motor patterns required to row fast. Even though the focus of a particular phase of training may be endurance, a few bursts of speed, such as 250m efforts or some starts, once a week, can help to maintain your ability to row fast. A certain degree of muscular strength and power will also be required to row fast so the factor limiting speed in a weak athlete may be strength or power.

Another common limiting factor, when it comes to rowing at race pace is that the athlete is not technically proficient enough to bring the rating up without causing major problems. Therefore you must ensure that you perfect your technique before attempting large volumes of high rating speed training. Particularly you should ensure that you have clean finishes, fluent hands around the back turn, good blade control on the recovery and sharp catches. If you miss water at the catch at low ratings, then this will be amplified at higher ratings, so make sure you have perfect catches, letting the water catch the bottom edge of the blade before it changes direction and burying the blade quickly to the perfect depth.

So once you have prepared yourself both in terms of fitness and technique, it is time to start to include sets specifically aimed at improving speed in your training program. This type of training will usually occur in the last phases of your training leading up to a major competition (ie, the competition phase and taper).

> "MOST GOOD TRAINING PROGRAMS INCLUDE A SPEED THREAD THROUGHOUT THE PROGRAM TO MAINTAIN THE MOTOR PATTERNS REQUIRED TO ROW FAST."

True speed training will consist of a series of short sprints with enough time in between to fully recover. These may be in the form of starts or overrating bursts (say 5-15 strokes). Speed drills can be very useful inclusions in your program. These combine technique with speed training to benefit both the skill and fitness side of speed development. Remember, when doing speed work, allow 5-10 minutes between each effort to ensure the full recovery of the alactic and lactic acid energy systems.

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The Dry Side of Training cont'd from page 3

etitions in each set. Rest 10-15 seconds between each set. Most adults begin with only five repetitions of each exercise, then increase the numbers as they get stronger. you should be able to tell a difference in only a few weeks. By strengthening the abdominal muscles, you also decrease your chances of developing future back problems.

Weight Training

A swimmer can save a great deal of time by building much needed strength in the weight room versus trying to build the same amount of strength in the pool. There are no magic machines in the weight room, but a good overall strength building program can help a swimmer tremendously.

Some adults think there is a particular machine that you should use if you swim butterfly, but if you're a backstroker a different machine is best. Most of our college and club coaches agree that a general strength-building program is the most beneficial. It is true that re are certain muscle groups that generate a larger percentage of the power than other muscles for the activity of swimming.

Many swimmers have a misconception that when they swim it is primarily their chest muscles (pectorals) that they are using. But if you are swimming correctly, it is your back muscles (latissimus dorsi) that are being used the most for forward propulsion. Therefore, the chest muscles are often underdeveloped. have you ever noticed that many of our swimmers are round-shouldered and have poor posture? This is caused by overdeveloped chest muscles. Many coaches are putting more emphasis on exercises, such as the bench press, in order to strengthen the chest muscles so that swimmers will have better muscle balance and posture. Stretching exercises will also help improve posture, muscle balance and flexibility. Both weight training exercises and stretching are extremely important for proper swimming technique.

A good general strength training program n usually be found at most health clubs, MCAs and gyms. Instructors will be able to help you develop a program that is good for you, whether it is Nautilus, Cybex, free weights or the Universal gym. Most adults are busy and do not have a great deal of time to spend in the weight room. If you are interested in achieving a great deal of bulk (which most swimmers and triathletes are not), then it will take more time to achieve your goals. A very adequate strength program can take as little as 20-30 minutes three times per week (minimum two times a week). Although some people like to do more, a good weight workout can consist of 12 to 15 stations.

Ideally, it is best to do your weights every other day. For most adult swimmers, performing one set of repetitions (usually 8 to 12 reps) to fatigue is adequate. Some programs use lighter weights, but perform 25 to 30 repetitions for more of an endurance program. Performing two or three sets with increasing intensities and decreasing repetitions is beneficial for some people and develops additional muscle mass. Adult swimmers with an already full schedule can make adequate strength gains by performing one set per machine. you must develop a program that you will be able to maintain in order to derive the benefits.

Most coaches feel that it is beneficial to do your weights after your swimming workout if both are performed on the same day. If weight training is done before swimming, the arms and legs are usually very fatigued and proper stroke mechanics are not maintained during the swim workout. If weights are done following the swimming workout, you can better afford to fatigue the muscles. Ideally, it would be most beneficial to do the weight workout in the morning if you swim in the evenings, or vice versa, or to do them on separate days. However, most adult swimmers do not have this luxury and must do them whenever time permits. Weight training can definitely help increase your swimming speed, but remember, it should be an addition to your swim training program and not a replacement for your swim workout (unless you are already swimming five to six days per week).

"MANY SWIMMERS HAVE A MISCONCEPTION THAT WHEN THEY SWIM IT IS PRIMARILY THEIR CHEST MUSCLES (PECTORALS) THAT THEY ARE USING. BUT IF YOU ARE SWIMMING CORRECTLY, IT IS YOUR BACK MUSCLES (LATISSIMUS DORSI) THAT ARE BEING USED THE MOST FOR FORWARD PROPULSION."

Dryland Training

If you are stretching, doing abdominal exercises and performing three swim workouts per week, then the next best thing to improve your swimming (besides weight training - or preferably in addition to weight training) is to develop a dryland training program. If you do not have access to a weight room, a good dryland training program is very beneficial in developing strength and endurance.

If possible, set up a dryland training program in addition to your weight program, but on the opposite days. A good dryland training program can take as little as ten extra minutes or if time permits, up to 20-30 minutes per session. It is more fun to do your training with a team, but most dryland training exercises can be done on your own and almost anywhere.

The following are several different types of dryland training exercise.

- **Push-Ups** - Push-ups will only take about 30 seconds. The best time to do them is right after you finish your abdominal exercises. Push-ups are especially beneficial if you are unable to train with weights. Start with two or three push-ups and build to as many as you like. Remember, keep good form.
- **Stretch Cords, Bands, Surgical Tubing, Swim Benches** - If you are working with tubing, the thickness of the tubing may vary, so be careful that the resistance is not too great. if you are prone to shoulder problems, cautiously monitor your shoulders as these exercises will put additional strain on them. Benefits can be gained by doing ten to twenty minutes of these exercises every other day. This type of training is very beneficial in developing the triceps which are used to finish your stroke as well as build endurance. There are many different positions that simulate the actual swimming stroke and are beneficial in developing proper stroke mechanics. Stretch cords are especially advantageous to adults because they can be easily set up at home or taken on trips. Swim benches are more permanent fixtures, and they are even more beneficial if they are equipped with computer printouts. Repeats and intervals equalling the time of your events are often done with usually ten to 30 seconds rest. Remember to warm up and warm down with the tubing or the benches when performing these exercises.
- **Plyometrics** - Swimmers need a great deal of strength in their legs for pushing off walls as well as for quickly getting off the blocks. A series of plyometrics can be done in two to three minutes. Jumping side to side quickly, high jumps in place, jumping forward and backward, and high jumps performed side to side as well as forward and backward are all beneficial. Fifteen to 30 seconds of each of these exercises with the same amount of rest in between each set are more than adequate for adults. Step-up exercises may be used as well.
- **Medicine Balls** - Not many adults use medicine balls, but their popularity is returning with the college and club swimmers. There are definite benefits and strength gains from using a medicine ball besides the variety that it offers to the athlete. medicine balls come in different weights, so be careful not to use a weight that will cause too much stress on your joints.
- **Tethered Swimming** - This can be done in home pools or you can tie your tether to the starting block at your local pool. Tethered swimming is swimming in place while attached to tubing by a band around your waist. Swimmers can either swim in place to build endurance or swim against the tubing to the other end of the pool to build strength. Tethered swimming also permits speed work if you swim back to the other end of the pool with the tubing 'pulling' you at a speed faster than you could normally swim. Tethered swimming is stressful on the shoulders and should be approached cautiously.

If you desire to achieve a peak performance, you must carefully balance work, training, sleep, diet and relaxation. It can be done if you make a sincere effort to maximise your training time. In addition to swimming, you can easily add stretching, abdominal exercises, weight training and dryland training to your weekly schedule. All of the above suggestions will only add three to four additional hours to each week. The biggest plus is that almost all of these can be done in the convenience of your own home.

With careful planning, you can make your wish of a peak performance come true!

Using Anaerobic Threshold in Training

© by Dr Peter Reaburn
Triathlon Research Initiative, Central Queensland University

Of all the scientific ways to monitor running intensity, heart rate is the easiest yet most overlooked. Heart rates measure intensity because of the linear or straight line relationship between heart rate and running pace.

Heart Rate Deflection Point

Some sport scientists believe that pulse rates and workout intensities are not linear at higher workout intensities. They believe there is a point during hard exercise at which workout pace increases but pulse rate begins to fall behind (see Figure 1). This point is sometimes used as the Anaerobic Threshold or the point at which the runner shifts from aerobic (with oxygen) to an increasing reliance on anaerobic (without oxygen) energy supply.

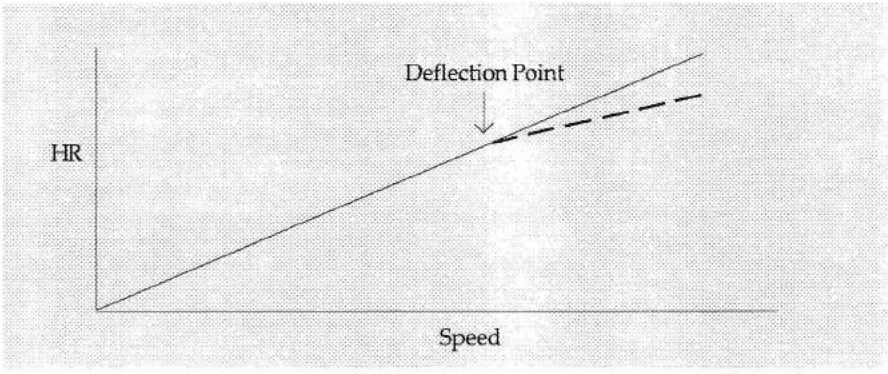

Figure 1: Heart rate versus workload graph with deflection point

The heart rate deflection is highly individual and changes depending on the runners's training status. Increased fitness leads to an increase in speed at the deflection point, decreased endurance fitness a decrease in deflection point speed.

Determining the HR Deflection Point

An Italian sports scientist, Francesco Conconi developed this non-invasive method of determining anaerobic threshold which he suggests correlates closely with invasive blood measuring methods for determining anaerobic threshold. The method for conducting the test is as below:

1. Go to a measured 400m track
2. Set up markers (or buddies) at the 200m and 400m points
3. Put on a heart rate monitor
4. Warm-up for 15-20 minutes
5. Start running at a slow pace for the first 200m
6. Record (hit the button on the HR watch or call HR to a buddy at each 200m)
7. Measure the time for each of these 200's
8. Increase the speed of each 200m by a couple of seconds
9. Continue until exhausted
10. Warm down
11. Convert the 200m times to a pace in k/hr by using the formula: 720/time per 200m
12. Plot the graph in Figure 1.

Cyclists can do a similar test by increasing workload by about 20 wattts every minute on a windtrainer.

What do I do now?

Training intensities can now be determined from this test. The following intensities and durations are suggested for training runs or intervals.

Percent of HR Deflection	Duration (mins)
100	6-12
97	20-30
90	30
80	50-90
75	90-120

As you get stronger through training, the test should show an increase in speed at the deflection point.

Testing

This test can be repeated 4-6 weekly but must be done under similar conditions:

- same conditions
- same time of day
- no heavy meals three hours before
- no alcohol 24 hrs before
- well rested
- no coffee, tea or caffeine drinks (coke, lift) before
- no hard training day before or day of testing
- be warmed up
- be medically capable of doing the test

A word of caution

From my personal experience, not all athletes demonstrate the deflection point while others, including myself show an upward deflection instead of the classic downwards deflection shown in Figure 1. However, given that the test is relatively easy to administer and is non-invasive, try it and see if it works for you. However, ensure you are fit and have the capacity to push yourself - it's not an easy test to perform.

Carbohydrates Role In Sickness Prevention cont'd from page 1

Table 1: Recommendations for Use of Sports Food in maintaining or elevating blood glucose

Sport Food	Before	During	After
Sports Drink	500mL 60 mins before	150-300mL every 15-20mins	750mL for every half kilo of weight loss
Sports Bars	One bar 2 hrs prior	Use during loading rather than during racing/training	One or two bars immediately after
Sports Gels	One pack prior to race and drink enough water to dilute carbo content to 6-8g CHO / 100mL fluid	As long as you are getting enough fluid, eat enough to supply 30g (easy work) to 60g (hard work) of gel per hour	Immediately after and at one hour intervals to deliver one gram of carbo per kilo of body weight

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CYCLING

Cycling Overuse Injuries

© by Liz Hepple (QAS cycling coach)

As we get older, physical activity is even more important for our health and well being. Immobility and inactivity have more damaging effects on structures and functions in older people than in younger adults.

However, as masters athletes, the older we get, the more we are at risk of 'overuse' injuries, as our body is not able to cope as well with the high levels of loading.

With older cyclists, the connective tissues become stiffer, making the muscles and tendon tissues more prone to ruptures and muscle damage is repaired more slowly. Joint cartilages also harden as we age, and are more prone to inflammation.

Overuse Injuries

It is important for masters cyclists to recognise the types of overuse problems they may be subject to, so that action can be taken to minimise the damage caused.

Knee pain

Cyclists are notorious for having overuse problems in the area of the knee joint. The common ones are as follows:

- Chondromalacia of the patella, which involves a softening of the cartilage behind the kneecap, and a resultant painful grating sensation.
- Patellar tendinitis (below the kneecap) and quadriceps tendonitis (above the kneecap) result in localised tenderness in their respective areas.
- Medial plica/medial patellofemoral ligament injuries cause a disabling and sometimes intense pain on the inside of the knee.
- Iliotibial band syndrome is caused by irritation of the ITB over the lateral (outer) side of the knee, and sharp or stabbing pain is felt.

While unusual anatomy such as pronation (arch of foot rolled inwards) and internal tibial rotation (lower leg twisted inwards) can predispose a cyclist to these problems, the most common causes of knee pain can be corrected.

One cause is a seat position that is too low or too far forward that increases the stress on the knee joint. In addition, an abrupt change in training loads ñ either an increase in mileage or too much big gear/interval work, can bring on knee pain. Also, since the inception of clipless pedals, incorrect placement of the foot onto the pedal surface (with fixed cleats in particular) has been shown to cause stress on the knee joint.

Lower back pain

Most serious cyclists will have experience lower back or hip pain at some stage during their cycling career. This occurs because the pelvic area acts as a 'platform' for controlling and powering the bike. If there is tightness or instability around this area, fatigue sets in quickly, and pain and injury follow.

An unsuitable 'reach' (length of top tube/stem, handlebar height and fore-aft seat position) is a common cause of lower back pain, as it increases the stress on the vertebrae in this area. A seat that is too high also causes side to side tilting, and resultant back pain.

Tight thigh muscles also cause the pelvis to tilt either too far forward (quadriceps) or too far back (hamstrings). Imbalance in strength/flexibility in the hip and trunk muscles can also result in stress and pain in this area.

Neck pain

Not usually as debilitating for cyclists as back and knee pain, is the literal 'pain in the neck' felt by cyclists after long rides. It's not surprising that this occurs when you consider the amount of time cyclists spend, with their backs horizontal and necks hyperextended so they can look down the road.

Also common after long rides is a pain in the upper back, between the shoulder blades, or down the trapezius muscles. This is a result of the load placed on this area to support the rider on the handlebars. This sort of pain is often felt as a 'spasm', and the muscles feel tight 'like rope' and very tender if pushed.

These problems are more common at the beginning of a training season, when the body is unaccustomed to the long rides, but may be a result of other factors. Sometimes the helmet is worn too low over the forehead, causing the cyclist to hyperextend their neck to a greater extent. Or such pain may be the result of an overly rigid arm position, so it is important to relax the elbows somewhat and change the hand position on the handlebars frequently.

> "WITH OLDER CYCLISTS, THE CONNECTIVE TISSUES BECOME STIFFER, MAKING THE MUSCLES AND TENDON TISSUES MORE PRONE TO RUPTURES AND MUSCLE DAMAGE IS REPAIRED MORE SLOWLY."

Stretching the neck and thoracic (upper) spine regularly, as well as performing neck strengthening exercises (place hand behind back of head, push head backwards while resisting with hand), will reduce the severity and frequency of neck problems considerably.

Prevention

Bike position

The most important factor in preventing injuries is ensuring your bike fits properly and that it is set up correctly. By achieving the 'perfect balance' on the bike, many of the common injuries can be prevented. If you are in doubt, refer to the article on bike position in an earlier issue, or get someone from a reputable bike shop or club to check your position.

Flexibility/muscle balance

Flexibility in the major cycling muscle groups is essential if you are going to remain injury free. Particularly important for knees and backs are the quadriceps, hamstrings, gluteals, lower back and ITB (side of thigh). For the upper body, the side of the neck, upper back and chest muscles should be stretched.

Floor exercises for front and oblique abdominals and back muscles should be performed several times a week to ensure a muscle imbalance here doesn't cause back pain, and will also increase your efficiency pedalling.

Training loads

A rough guide for raising your mileage safely would be a maximum of 10% increase in mileage per week. It is also suggested that the first 800 kms of the season be performed in the little chain ring, aiming for a cadence of 90 ñ 100 rpm before thinking about using a big gear. Then phase in big gear training gradually, always alternating ëbig gearí and "little gear" training days. Hills should also be phased in gradually, and long climbs should be performed pushing the butt to the back of the seat so that different muscles are used, and leverage is optimised.

Sports Medical Services

If you follow the above guidelines, hopefully you will remain injury free. However, if you still develop an injury, find a good sports physiotherapist (particularly one who specialises in cycling injuries) to help speed recovery. You may also need to visit a suitable doctor if anti-inflammatories or as a last resort, surgery, is indicated.

Carbohydrates cont'd from bottom page 8

Other tips to prevent illness

- Keep work and family work pressures to a minimum
- Use a multivitamin/mineral supplement if not sure you are on a well-balanced diet
- Vitamin C may help reduce damage to immune system cells
- Avoid overtraining by a gradual increase in training load, having rest days or periodising training (see Greg Rowsell's article)
- Get regular and adequate sleep – disrupted sleep negatively impacts on the immune system
- Avoid rapid weight loss – it negatively impacts on the immune system
- Keep the hands away from eyes and nose
- Avoid sick people and large crowds when possible

Good luck for an illness free and well deserved Xmas break.

All you Need to know About the Glycemic Index

© *by Dr Peter Reaburn*

Eating carbohydrates between training sessions or after races is important to enhance recovery. Not so long ago we talked about simple and complex carbo's, now we talk about the GI or **GLYCEMIC INDEX.**

At endurance race pace it takes about 60-90 minutes to severely deplete our carbo stores. However, muscle carbohydrate can also be depleted after only 15-30 minutes of very high intensity training such as interval or speed work. It takes about 20 hours to completely recover the hungry muscle's stores. This has strong implications for masters athletes that train twice a day or do interval training as suggested in issue 1 of TMA.

After training or racing, athletes need to consume carbos that can be very quickly converted to blood glucose and then transported in the blood to the muscles. To help us get the carbos quickly into the blood and to the muscles, carbohydrates can be classified according to their ***glycemic index*** (GI).

The GI measures the extent to which blood glucose is elevated above resting levels for a period of time after eating a food containing 50 grams of carbohydrate. The increase in blood glucose is expressed as a percentage relative to the increase observed after eating a standard type of carbohydrate such as bread or simple glucose, which rate 100. Foods can be classified as having a high (>85), moderate (60-85) or low (<60) GI (see Table 1).

Carbos eaten during exercise or recovery should be rapidly absorbed and thus have a high glycemic index. They should also be combined with fluid intake since it takes about 3 grams of water to store 1 gram of carbo in a muscle. In contrast, normal athlete meals should contain slowly digestible sources of carbos and thus have a low glycemic index (cereals, beans, fruit).

The important dietary factors that dictate the rate of carbohydrate rebuilding in muscle are:

1) the rate of carbohydrate intake;
2) the type of carbohydrate;
3) the timing of carbohydrate intake

The Rate of Carbohydrate Intake

Carbos are remade at 5% per hour when athletes ate 50g every 2 hours, but do not increase when 100-225g of carbos are eaten every two hours. This suggests the need to consume about 50 grams of carbos every 2 hours to recover carbo stores.

Masters endurance athletes probably expend about 3000 calories per day when training and are advised (based on the recommendation of 70% of calories coming from carbos) to consume approximately 500 grams per day of carbo. This amounts to 8 -10 grams of carbohydrate per day per kilogram of weight. This is about 10 x 50 gram portions per day (see Table 1).

Table 1 is based on a person 70kg in weight. You might need to adjust the figures if you weigh more or less. For example, a 100kg man should multiply the recommended grams by 1.4 (100/70), a 50 kg women by 0.7 (50/70).

The Type of Carbohydrate

Both moderate and high GI foods remake muscle carbohydrate at 5-6% per hour. Foods with a low GI (fruits, beans) are only replaced at about 3% per hour and are clearly not recommended for immediate recovery.

Research also suggests that carbohydrate in liquid or solid moderate-to-high GI form is equally effective as solids. However, if fluids are needed after a session of high sweat rates, then the fluid forms are the recommended alternative. Sports drinks, soft drinks, and cordials fit this bill.

Timing of Carbohydrate Consumption

During the first two hours after a workout, the rate of muscle carbo rebuilding is 7-8% per hour with some suggestion that this rate is even higher in the 30 minutes following exercise. This indicates the need to eat or drink moderate-to-high GI foods straight away after training or competing. Following this initial intake, 50g of carbohydrate should be eaten every two hours until the next large meal.

Just when you thought you had a handle on carbohydrates, the glycemic index comes along and confuses the issue. I strongly suggest you try the suggestions above to aid recovery from those tough workouts or races.

Table 1. Carbohydrates that have a high-, moderate-, or low-glycemic index (GI). The figures in brackets are the amount required to yield 50 grams of carbohydrate.

HIGH GI (>85)	MODERATE GI (60-85)	LOW GI (<60)
Glucose (4.2 tbsp)	Rice (1 cup)	Apples (2.4)
Sugar (4.2 tbsp)	Oatmeal (2.1cups)	Dates (8)
Bread (3.5 slices)	Pasta (1.5 cups)	Figs (5)
Potatoes (1)	Grapes (3.1 cups)	Peaches (5)
Sweet Corn (1.2 cups)	Oranges (3)	Pears (2)
Honey (2.8 tbsp)	Sweet potato (1.3 cups)	Plums (5.6)
Bagels (1.6)	Baked Beans (0.9 cup)	Beans (1.5 cups)
Raisins (0.4 cup)		Lentils (1.2 cups)
Watermelon		Yoghurt (2.8 cups)
Lucozade		Milk (4.3 cups)
Lollies		
Weetbix		

TRIATHLON

Periodisation

© by Greg Rowsell (Triathlon Research Initative, Central Qld University)

The concept of periodisation plays a central role in the planning and implementation of any athletes training program. Periodisation is the process of dividing the training year into more manageable units. Each unit is designed to achieve a particular objective (speed, speed-endurance, and endurance).

The basic premise of periodisation is that the greatest performance gains will be realised when specific physical parameters are emphasised at particular times. This makes sense as Bompa (1983) and others have shown that some physiological parameters are pre-requisite to the development of others. For example, many coaches would argue that aerobic base training (easy runs, rides, rows or swims) should precede anaerobic threshold and VO2 Max type training.

he aim of a periodised program is to lop a specific physical parameter dur- training block. Subsequent training blocks are designed to build on this by emphasising a different physical parameter while maintaining the parameter developed in the previous block. For example, the total distance run per week is gradually increased during a block of training that emphasises endurance. This endurance can be maintained during the next block by completing one long run per week. The volume, intensity and frequency of training can be manipulated to achieve particular training objectives. For example, incorporating periods of reduced training where the training load is decreased can enhance adaptation. This can be achieved by reducing the number, duration, and intensity of training sessions during that period.

Most coaches develop a periodised plan for each season. The season is broken down into distinct phases, which are known as macrocycles. It is common to divide the ar into three major periods: preparation, competition, and restoration. Each macrocycle can then be divided into a number of mesocycles. These are typically four weeks in length and often consist of four, one week microcycles. A microcycle is made up of a series of individual training sessions and can be your typical training week.

The aim of a periodised program is to provide a logical and sequential framework for the development of performance relative to the specific demands of competition. This can be achieved by systematically and progressively increasing the training stimulus over a number of microcycles. These so called loading microcycles are interspersed with periods of reduced training to promote adaptation. For example, in a typical four week mesocycle, the training load is systematically increased during the first three weeks through increasing the volume of training each week. The volume of training is then considerably reduced in the fourth week to allow the athlete to recover.

Fry, Morton and Keast (1992) point out that the typical periodised training program begins with a focus on longer, slower endurance work and strength. As the season progresses the emphasis shifts to shorter, faster interval work. Training loads can be described as higher volume, lower intensity in the preparation phase, and lower volume, higher intensity in the competition phase. The amount of work completed at and above race pace tends to increase as the season progresses. The table below is an illustration (not a recommendation) of how this approach may be reflected in one main set of a 1500m swimmer with a goal time of 25.00mins.

Table One: Possible main sets for a 1500m swimmer using a traditional periodisation approach.

Macrocycle	Mesocycle	Wkly Volume	Main Set	Goal Time	Heart Rate
Preparation	General	30km	2 * 1500m on 27	1.50 per 100m	60-50 below max
	Specific	25km	5 * 500m on 9.00	1.45 per 100m	50-40 below max
Competition	General	20km	8 * 200m on 4.00	1.40 per 100m	30-20 below max
	Specific	15km	15 * 100m on 2.00	1.35 per 100m	20-10 below max

The approach described above is a popular one and it leads me to assume that coaches are happy with the results it produces since this method of periodisation is used year, in year out. However, the important question to ask is, does this method of periodisation produce the best possible performance outcome for all your athletes? I would argue that it cannot.

When an athlete resumes training at the beginning of the season the goal of the coach is to implement a program of training and competition that will lead the athlete, step by step, toward a peak performance. The coach needs to be able to analyse the performance of each athlete in order to prescribe appropriate training strategies to enhance performance. Training should be directed at improving those physiological parameters that limit individual performance.

There is absolutely no doubt that it is important to periodise the yearly training program. However, each athlete has different needs. This means that athletes require an individualised periodisation plan to optimise their performance. For example, an athlete with a training age of ten years, who is returning to training after a three week break should be trained differently to an athlete of the same chronological age who is new to the sport.

In this example the beginning athlete should spend much longer in the preparation phase. The emphasis would be on a gradual and systematic increase in training volume. The more experienced athlete by contrast, will adapt quickly to the training stimulus and regain their aerobic base within three to five weeks of training. The training emphasis must then change if the athlete is to continue to progress.

Anderson (1997) argues that simply changing the volume and intensity of training as the season progresses does not produce the maximum possible performance gains. He believes that performance can be optimised when blocks of training are designed to enhance specific physical parameters. In essence it is how we periodise the program for athletes that determines how fast they go.

So how would you individualise a periodisation plan for the experienced athlete above? Anderson (1997) suggests that the first training objective would be to increase the "size" of their engine by developing VO^2 Max. This suggestion is based on the idea that the more oxygen you can use per minute the more "work" you can do. The next block of training could then focus on raising the anaerobic threshold to the highest percentage of VO^2 Max. This would enable the athlete to sustain a faster speed for longer. Improved economy could be developed in the next block. The aim being to reduce the "cost" of moving at a given speed.

Anderson (1997) talks about using three to seven week blocks of training with an emphasis on achieving a particular goal eg. developing VO^2 Max because experienced athletes can adapt quickly. Once the training goal has been realised the training emphasis needs to change so that the athlete continues to develop their physical condition. Some ideas for improving VO^2 Max, anaerobic threshold, and economy appear below. The examples given are for a runner but the same principles apply to swimming, biking and rowing because the energy systems are time and intensity dependent.

Experienced runners can boost their VO2 Max can by surging through a series of three to five minute intervals at current 5km pace, after completing a thorough warm-up! The rest period should equal the length of the interval and the number of intervals can be progressively increased until you are doing about 20 minutes of VO^2 Max work. Anaerobic threshold can be improved by building up to doing three ten minute intervals at 10km pace with three to five minute recoveries. Economy can best improved by running uphill with a good option being to include some hills in your long run.

The key point is that periodisation is an effective way to divide the training program in to

Continued on page 12

Rowing continued from page 6

Suggested Speed Development Drills

Slide Reduction Exercises

Build up to a strong rhythm (eg, rating 26-28). Gradually reduce your slide length to half slides and maintain for about 15 strokes, then move back out to full slides attempting to maintain rating. As you get more proficient at high ratings, start the exercise from a higher rating and drop down to half slides over a single stroke. Challenge yourself to see how high you can rate at half slides (still rowing cleanly) and also when you go out to full slides. You can also experiment with different slide lengths during the exercise ñ eg, going down to back-chock rowing.

Overrating Bursts

Build up to race pace and maintain for about 10 strokes. Step up to above race-pace and maintain for about 10 strokes. Then settle back down to race-pace and hold for another 10 strokes. Make sure you allow full recovery between these efforts as they can be quite fatiguing.

Quick-Hands Exercises

Sit at back chocks and row arms-only. Start off slowly with perfect technique. Gradually wind-up the rating, getting faster and faster. This exercise can be good for developing hand speed, but make sure you are not simply throwing the hands out faster than they come in ñ hands should flow around the back turn and come out at the same speed at which they come in. Also make sure you are finishing off each stroke strongly, drawing through to the body and not washing-out to facilitate quicker hand speed.

Starts

Practice starts by building up from single strokes, to complete starts followed by race-pace efforts (eg, start plus 20 strokes at race pace). When you are practicing your starts, you don't always have to row at 100% - skills are often better learnt by practicing them at lower intensities and, once mastered, building up to full pressure. A variation on the normal start, which can be beneficial for speed development is to not lengthen out. That is, stay at half slides after the initial start and maintain an exaggerated high rating.

Of course there are many possible variations of all of the above drills. Experiment by varying the duration, ratings and slide lengths of all of these exercises to find what works for you. Remember at all times that it is important not to compromise good technique just to get an extra point or two in rating.

Trouble-Shooting

If you are having trouble getting the rating up then firstly go back to the basics and check that you are adequately prepared ñ both in terms of fitness and technique. If you are not then you will struggle and you may need to reassess how you prepare for your next competition. Although it very important to row with a long stroke, some athletes tend to overreach at the catch, getting themselves into a weak position. This is another possible cause of difficulties in bringing up the rating. If you are struggling for rating then you may need to sit up into a slightly stronger position at the catch, rowing a slightly shorter but more effective stroke. Finally slow hands around the back turn are also a common cause of problems when it comes to bringing the rating up. Make sure you keep your hands flowing around the back and you should be able to maintain a good rhythm as you increase the rating.

Like all aspects of a well thought-out training program, by planning when and how you are going to do your speed training, and by preparing all of the body's systems for this type of training, then the benefits you get will be optimal. Always remember quality when you are training from speed. Everything you do should be of the highest quality, so you should make sure that you are well prepared, give yourself plenty of recovery and never compromise your technique.

Periodisation continued from page 11

distinct blocks. This allows the coach to emphasise different aspects of training to achieve particular goals. However, it is essential that coaches optimise the performance of their athletes by designing a periodised plan that is appropriate to their individual needs.

References

Anderson, O. (1997). Things your mother forgot to tell you about the periodization of training. Peak Performance 94: 1-10.

Bompa, T.O. (1983). Theory and Methodology of Training. Dubuque, IA: Kendall/Hunt.

Fry, R.W., Morton, A.R., and Keast, D. (1992). Periodisation of Training Stress ñ A Review. Can. J. Spt. Sci. 17:3 234-240.

Harre, D. (1982). Principles of Sports Training: Introduction to the Theory and Methods of Training. Berlin: sportverlag

From the Research

Triathletes race better glycerol-loaded

Large fluid losses in runners and cyclists has been shown to decrease performance. Recently a new "hyper-hydrator" of fluid loader has been suggested as a way of increasing the bodies water stores before a race. A recent master's thesis at Central Queensland University has strongly suggested that glycerol has performance benefits for endurance athletes in hot and humid conditions. Ten well-trained triathletes completed two Olympic distance triathlons (ODT) on two occasions two weeks apart. On one day the temperature was 30.5 ºC and on the other 25.4 ºC. The glycerol solution consisted of 1.2g of glycerol per kilo of body weight and 25ml of half-strength Gatorade® and was consumed over 60 minutes two hours prior to one of the races. A placebo solution of half-strength Gatorade® and saccharine was used in the control condition. The results showed that the difference in ODT performance between the hot and warm days was less in the glycerol-loaded condition (1 min 50 sec) than the placebo condition (11min 45 sec). The results strongly suggest that ODT performance in hot and humid conditions can be improved with the use of glycerol.

Editor's note: Glycerol is available from chemists as *Glycerin* that is commonly used in cooking and as a sweetener for kids. Cost is about $3 for 250 mls. Be warned, loading does make you feel a little bloated and the solution does taste a little sickly - try it first in training.

Coutts, A., Reaburn, P., Holmes, M. and Mummery, K. (1998). *The effect of glycerol loading on Olympic distance triathlon performance in hot and humid conditions.* Proceedings of the Australian Conference of Science and Medicine in Sport, Adelaide, October.