

The World Swimming Coaches Association Newsletter

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The Performance Clock THE MOST IMPORTANT CONCEPT IN HIGH PERFORMANCE SPORT.

By Wayne Goldsmith | In High Performance Sport

I often get asked, what's the difference between sport and high performance sport.

Read the next 800 words and find out.

Winning is rarely about doing it once and walking away. Winning is about Sustaining Performance: Sustaining Competitiveness: about getting to the top and Staying There.

Lots of people, teams, coaches, athletes and companies win once – but very few are able to adopt the thinking, systems and practices that enable them to sustain competitiveness year after year after year.

Why is Sustainable Competitiveness so important?

No one goes from being Uncompetitive to Winning. Being Competitive means you can launch a winning campaign or grand final winning plan from a position of relative strength. It is almost impossible to go from last (or near last) to first in a single year or season.

Sporting teams – particularly football teams – are notoriously BAD at sustaining competitiveness. They blame the draft. They blame salary caps. They blame the Governing body. They blame injuries. They blame not having enough money. They blame everything

except the thing that really makes the difference: their ability to seriously commit to continuous improvement and accelerated change.

With very few exceptions, around the world, most teams feel the need to (unnecessarily) go through the Performance Cycle:

Stage One: Non Competitive: The organisation is failing to perform and struggling to survive;

Stage Two: Striving For Success: A passionate person and / or motivated team ignites the desire to succeed and inspires the organisation to strive for success. The acceleration of progress comes from embracing change and learning and the commitment to turn learning into action;

Stage Three: The Right Culture. The right people and the right environment are in place and the opportunity has been created for the Club to be successful;

Stage Four: Success: The organisation gets to the top but then loses momentum by ceasing to change and learn at the same rate. They adopt a "secret formula" mentality, i.e., "we know what it takes to win, therefore all we have to do is repeat what we did last year and we will keep winning". In the meantime the competition is accelerating their

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learning and performance – determined to become the next No 1;

Stage Five: The Fall: Things start to fail. Management and staff get sacked, reviews, reviews and more reviews are commissioned, finally the Board is overthrown, there is public brawling and the organisation is at the brink of collapsing altogether..... And we are back at STAGE ONE again.

I did some work with a top professional football team which was highly successful in the 1960's. Now, almost 50 years later, many of the players who starred on the field in the golden days of the club were running the Board, the Management committees, and even had a hands-on role in the coaching.

The biggest problem the club faced was that these people – with the welfare of the club in their hearts and only the best intentions - kept looking for ways of taking the club back to the 60's – because “that's the way we do it here”.

My reply was, “So your way is to fail to perform for 50 years?” After some heated discussion came the realisation that they needed to retain their proud traditions but embrace effective and meaningful change. Respect the past but embrace the future.

Most businesses, sporting organisations and even people perform in cycles.

There are times when they are performing well – and times when they are performing poorly.

The performance cycle of a sporting team can be compared to a CLOCK: the Performance Clock.

At 10 o'clock, the organisation is hungry for success and changing rapidly. They are accelerating their rate of change by learning fast and by being innovative, creative and committed to success;

At 11 o'clock, the team is close to their best. They are consistently playing well, making the final series and they are continuing to strive for success. Most importantly, they have created a culture which has a high likelihood of succeeding;

At 12 o'clock – the team wins the premiership or the World Championship, etc., – they are at the peak of their performance cycle;

Then a funny thing happens.....and no matter how many times I present this concept to organisations, it just keeps happening....

Often when a team is at the top of its Performance Cycle it stops doing many of the things it was doing to make it successful.

1 o'clock and the team stops being creative and open minded. They start believing that their way is the only way and that they have the infallible secret formula for success. This is the beginning of disaster! The teams that have to make the greatest commitment to change and improvement are the ones that are successful – why.....

Because your resistance to change is greatest when you believe you have all the answers and that's why most teams fail to repeat success!

So, what happens????? The team starts losing.

2 o'clock.....3 o'clock.....the coach gets sacked. The club starts spending money on new players, new equipment, new coaches in a frantic attempt to stop the decline in performance;

The team keeps losing. If they are in a relegation / promotion competition, they get relegated to the next league;

4 o'clock.....5 o'clock....the CEO and Management gets sacked. The organisation is in disarray;

6'clock. The team cannot win a game. The fans and the sponsors have deserted it. It appears that the team may never ever experience success again;

But then.....

7 o'clock – Someone decides things have to change. They put together a plan and find some people and money to make it happen;

8 o'clock.....9 o'clock – People start believing that things can change. New players, new coaches, new staff, new ideas.....there is enthusiasm and energy and passion in the Club;

10 o'clock and 11 o'clock – The cycle is complete and the team can look forward to a short period of success as their Performance Cycle is at its peak once more.

The reality for most sporting teams is that they spend one or two seasons at most between 10 o'clock and 12 and then often spend many many years between 1 o'clock and 6 o'clock! And for no reason! There is no reason for sporting organisations to spend years at the bottom of competitions.

The aim is to create a Sustainably Successful High Performance Environment – and to ensure your organisation is always competitive.

Winning once can be luck – sustainable competitiveness comes from good planning, good management, good vision and hard work.

Success is not a destination - success is a moving target and your aim must continually be adjusted if you want to keep it in your sights!

So the difference between sport and high performance sport is this...if you understand this post – congratulations! You have a long career in high performance sport ahead of you.

If you don't understand it, enjoy a game of golf or tennis with friends and family now and again but stay out of the pointy end of sport. Please! ■

Wayne Goldsmith

For next Season.....?

By Roger Dalraine

Editors Note:

The following “conversational style” notes were written by Coach Roger Dalraine of the UK, now temporarily residing in the USA. Roger has provided a brilliant, albeit brief, synopsis of the training of young athletes from the “ground up.” Roger deliberately has “left out” some areas in this letter to several young coaches, to encourage them to search out some questions for themselves. As you read, see if you can identify the “missing areas.” The exercise is well worth the time. Thanks to Roger for allowing me to share this with you, over his “objections” that it was not thorough. In my view, thorough is not necessary to be “valuable” to many coaches.



John Leonard

Micro cycles

You can do these in anything from 2 – 26 weeks per cycle. I have experience of 2-8 weeks and major success with 3-8 weeks.

Age groupers go REALLY well with 4 weeks especially if you don't have a lot of hours.

For Maximal Success a) educate the swimmer and let them know WHY they are doing what they are doing – this will encourage commitment, especially as they see their time dropping on a regular (end of each cycle) basis and b) combine with heart rate work, rest and play.

HR's – should be taken with the right hand at the lower part of the neck about 1 1/2" above the collar bone. Take on a count of 10 and multiply by six – then they get a maths lesson as well! The alternative and better when they are used to it is a 6 second pulse followed by a 10 times multiplication!

They (HR's) MUST be taken IMMEDIATELY the exercise finishes since the fitter they are the quicker the HR will drop – and I mean QUICK.

ALSO VERY IMPORTANT – get them to take their resting HR – EVERY SINGLE MORNING TRAINING OR NOT - as follows:

Wake up – clear the mind (this will not be difficult for some!) of EVERYTHING.....wait 30 seconds and then take a 30 second reading. Let's say for a fit HS senior this is 42. Instruct them NOT to come to training if it is more or less than 10% off or on that figure. For ease we will say it is 40...so NO Training if it is 36 or less or 44 or more – one way or another they are going to get sick if you allow them to train in this condition.

Now we have the resting HR and the method of taking our HR's (so we need to practise doing this Coach – or we will be wasting their and your time – so do it together to start with) we can look at the work.

Most coaches do not understand REST – it is CRITICAL for BOYS and less so for the superior sex – that is girls and women who can do everything better than we guys can except for lifting heavy weights. This includes believe it or not killing somebody one on one – plenty of good research back to WW2 on that.

Let's go with 4 week cycles as a start:

W1 – aerobic (and by the way we ALWAYS – after I learned a little about coaching (!), went 4 weeks of this stuff at season opening). In effect for 10 and overs (measuring age the US way) this means HR's of 120 – 140.

IT IS NOT GARBAGE YARDAGE IF YOU COACH IT, understand what you are doing and why and COACH IT PROPERLY.

Note: This is the time to practise turns - Long, slow, (it will get quicker and quicker FOR THE SAME HR's as they get fitter and you will see, and

measure and record, this when you do the PROGRESSIONS (test sets - mentioned later). LSD (long slow distance) - swimming is the BASE of High Performance swimming - IF it is coached properly and with efficiency (fewer strokes/length, good turns throughout and so forth).

However it is a WASTE OF TIME unless they understand what they are doing it for and HOW they have to do it in order to succeed.

EVERY TURN a perfect turn.
EVERY Finish a PERFECT finish.

EVERY Length swum with max distance per stroke, breathing as required by coach, streamlining and so forth.

Practice stroke REDUCTION (increase their efficiency) - I would say a 5'10" boy swimming SCM would be looking at a MAXIMUM of 12 strokes/length at the END of a test set - my (and some of the swimmers too when they realised what it did for them) favourite was 10x200 on 4 minutes swimming even pace and reducing 1-5 and 6-10. A really good swimmer will be very close to their PB (within 2 seconds on the 5th and 10th of this set and we had a few of those who would do that and get fired up about it - thus improving other swimmers commitment to the work).

Zip Locking off EVERY start (yes you can dive sometimes) and EVERY turn. (There's 0.5 sec PB just for learning how to do that and doing it off a dive - let alone each turn - big sales pitch for Coach in order to get belief in, and commitment to, the system).

No breathing until second stroke on start, second stroke on turn.

"Oooh! that's hard coach" - "so think how it will help you in your next race".

Your swimmers are almost certainly warming up too fast. If you set a well thought out warm up they will not be able to complete it. Visiting and new so called "good" swimmers ALL warmed up too fast and could not understand why they could barely finish our warm ups let alone the main set. Eg - swimmer went to Puerto Rico to train (I was there) - 200m ahead at end of warm up (1200m) and again at end of Kick (1200) then they started to pull 10x200 - he was dead meat and falling behind the swimmers (same age, better quality, better coached than I knew about at the time) half way through that set and had to get out early from the 2 hr session. That would not have happened with my later swimmers who would have eaten the entire session with no problem - and come back for the afternoon as well - off 10 1/2 hrs/week. This is in red because it is IMPORTANT - something you may like to think about.

EVERY turn ACCURATE - EVERY Finish ACCURATE on the wall and with head DOWN (i.e., fully stretched out) EVERY time. Consistency here will win you close races at conference AND get you PB's when shaved for the big meet of

the season - only allowed one taper and one shave/season (all year round).

(At this point you might want to try doing this over a 20 minute warm up - you will be surprised how tired and aching you are if you did it properly and you may well not make it past 400 metres the first time or two - our Olympic swimmer could never make the warm up at the club and was getting badly beaten by our 14 year olds when he left (retired to a slower club) in both this and the main sets).

Done properly your swimmers, unless REALLY fit will have an awful job doing this and you may have to start warming up with 100's and/or 200's and work up until they can swim 1000 or whatever you deem sensible for their individual muscle mass/discipline.

Then start getting them to even split it or, better, go slightly negative when you are happy with that - still at the correct HR's.

Week 2 they get to increase the aerobic 140 -150 and at the end do some 150 -160 work - all over distance and DRILLS. They should by now be touching the end head down at full stretch and then, and only then, looking at the clock. For the fast work (and indeed most work to begin with you might think it worthwhile to keep a general watch on things in order to set the correct amount of work) you will be timing them going off - and coming back. In this way you will be able to FEEL how your swimmers are and where they are. If there is a meet this weekend - you swim through it but maybe let them do starts or diving exercises (ask me for ideas if you don't understand what this means) or some turns on the last session Friday morning or evening. This should enable them to "rest" a little!

Week 3 LSD and DRILLS in the mornings - UNLESS they will race in the mornings - in which case they need some fast work. Sessions will go - easy followed by hard. Hard means some anaerobic threshold and slightly above sets including one or two test sets (Tuesday and Thursday if you are racing the weekend) - but ALL over distance again. Easy means LSD - but all even split by now.

Tip from famous coach (guess what, he was right!) - if you are racing 200's (and same for all distances) TRAIN for 400's. You may wonder how the Aussies are so good at producing 1500 swimmers - main sets and test sets are 3000 metres - quite a few swum straight and either slightly negative or even all through - what a surprise!

Think about circadian rhythms and work it out for yourself. This also applies to racing in the mornings - if you don't practise hard work in the mornings sometimes how can you expect a fast early morning prelim?

Also - if they are going to be photographed, interviewed and so on get people in with a little equipment and RE-

HEARSE it. Shove a camera in their face before a really fast repeat off a board – they really do appreciate this if you EXPLAIN why it is being done – they have seen too many idiots (poorly coached athletes) on TV – and they are not stupid. Age groupers are very intelligent about this sort of thing.

Wk 4 same as three (INCLUDING DRILLS) but some over-distance hard work early in the week followed by half distance at race pace for the full distance for the later hard session(s). Of course if you don't understand pace you have a problem.

YOU COULD, OF COURSE, PRACTISE IT!

To begin, until they get really good, a 100 free (or back if you have taught them to start and turn) is split 2 seconds faster at the 50 – so a 60 second 100 free would split 29 (14,15) 31 (15,16). Fly (until they get efficient) is 4 seconds, Breast is 3.

When you see this happening – ask about the 200's and then about the 4's and so on.

Easy night/morning before the race.

Finally – and VERY IMPORTANT – see Jonty Skinner's research on SP1 and SP2 work in US clubs. He was big enough to admit his errors, print them all out for the rest of us, and the correction in work gave Amy a Gold Medal.

Checks

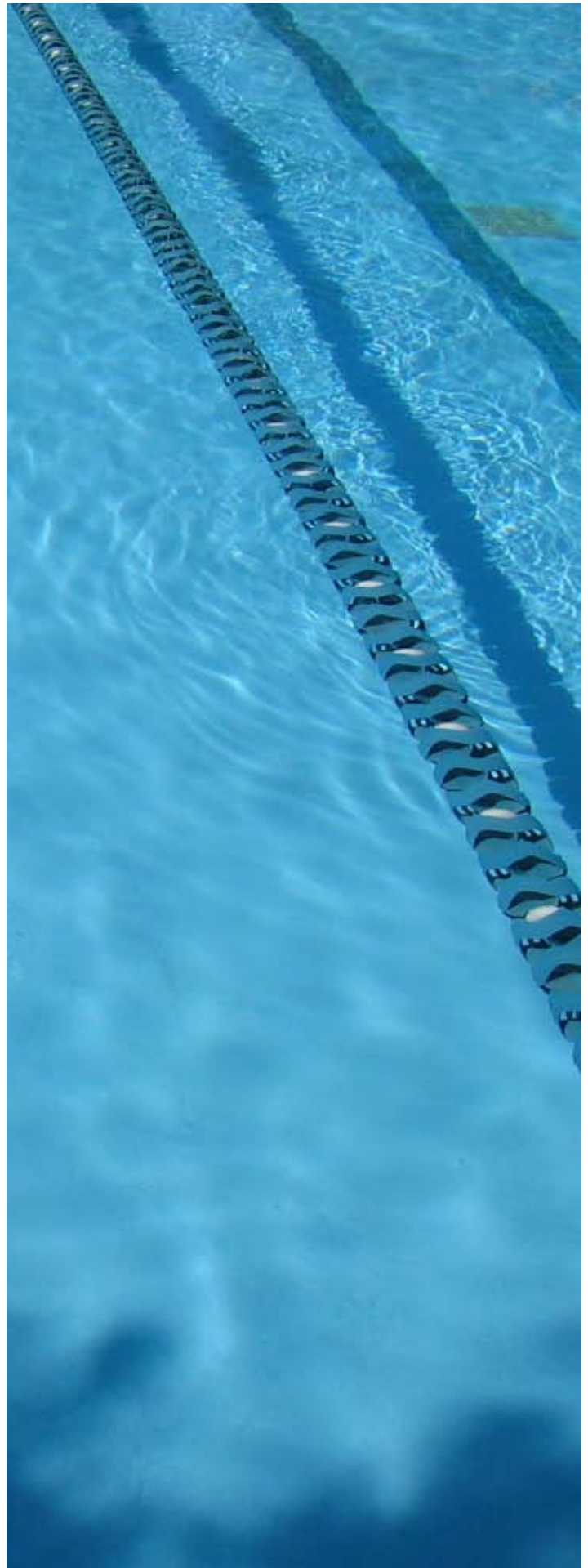
Everybody – once monthly check angle between foot and shin at stretch, swimmer prone (should be as close to 180 deg. As possible.

Flyers – hyperextend the knee by lifting the foot against it whilst clamping above the knee with your spare hand. If the heel lifts more than 1 1/2" you need to start exercises to tighten it up (hamstrings – cut out any quad work and DOUBLE the ham work. Hams STABILISE the knee. Had one swimmer that had a 8" extension here and learned from that!

BR's – and Flyers – check for scoliosis in the upper spine

If you are going to COACH – you need to LOOK at your swimmers and not just in the water. Get a "support staff" that are prepared to help you at cut price or better yet – FREE!

Let me know if you have any questions. ■



The Physiology of Being in Shape...

THE ADAPTIVE PROCESSES THAT ALLOW AN ATHLETE TO PUSH THROUGH THE CHALLENGES OF VIGOROUS EXERCISE AT EVER-INCREASING INTENSITY

By Coach Ed Nessel, R.Ph, MS, MPH, PharmD

Every person associated with prolonged vigorous activity realizes that with continuous training (appropriate or not) something positive happens over time that allows the body to withstand increasingly demanding physical challenges. Even if armed with only a superficial smattering of understanding physiology, the coach and/or athlete realize that somehow dedicated continuous exercise brings improvement in movement.

Climbing the mountain to being in shape is commendable but not enough. Who climbs without wanting to reach the peak? Like grabbing correctly for foot- and hand-holds on the slippery mountain face, grabbing hold of the correct physiology is the surest way to get to the top. The top here means reaching the maximum potential of the person doing the "climbing."

Getting in "shape" is neither easy to attain nor to explain. The human body is a wondrous machine with complicated systems able to produce great quantities of energy both quickly and over extended periods of time. This permits the body to try and adapt to whatever is physically challenging it and enlarge its capacity to handle increasingly more vigorous exercise. Unlike a manufactured automobile engine which has the exact parts needed to produce a certain amount of predicted energy and power, the human body's components can be made to produce more by having them induced more through utilizing specific physiologic protocols over time. In every instance of adapting to exercise, three main elements, the holy grails of athletic training as I see it, are brought into the picture and must be addressed to a greater or lesser extent depending upon the chosen venue and type of sport for participation: endurance, strength, and power. The correct pathway to physiologic condition is to build on endurance then go for strength and finally, most every athlete's goal: power.

Endurance

This is where it all starts if the coach and/or trainer and athlete approach getting in shape correctly. It takes the greatest amount of time and the most effort to develop all the physiological adaptations the body needs to capture endurance. It is not a simple goal; it is an ongoing process. When we speak of endurance we must include both the muscular and cardio-respiratory systems. When dealing with muscular tissue, endurance becomes specific to individual muscle groups. Each racing stroke has its nuances and particular muscle and energy demands and needs to be mixed appropriately with other elements. A breaststro-

ker swimming mostly freestyle is being trained incorrectly, even early in the season. Correct muscle training is highly specific since nearby muscle fibers that are not utilized in condition sets will not gain appropriately enough in endurance. It is more beneficial to work specific strokes on specific days or to simply mix free and stroke in what I call "twitch swims" for most training sessions.

My research over the years has shown that it is the kick that gets you to the wall in close races. On average, the fraction of total energy consumed in a race for distance freestyle is about five percent for the legs, sprint freestyle about 10%; strong backstroke demands between 20% and 25% legs, and butterfly requires strong hip action to go along with between 25% and 35% kick. The slowest stroke, breaststroke, requires the most from the kick where the legs drive the body forward demanding between 50% and 60% of total stroke energy. Knowing this, we must give the legs their due at each practice. They can be pushed hard and with less recovery between efforts. Some swimmers can naturally isolate leg pain and deal with it better than others. All must understand their importance to fast swimming: "no kicky...no swimmy." We need to build kick sets to work the specific muscle groups of the legs and to increase their endurance capacity over varying distances. An absolute minimum of 1000 yards in a training session should be devoted to kicking; some sessions doubling that would not be excessive with the majority of that being event-specific as stated above: a breastroker needs to kick breaststroke, a flyer must work the dolphin kick, etc., etc. Of course, logic and appropriate training would suggest that there be recovery sessions that allow intensely worked muscle groups an easier time of it.

When dealing with cardio-respiratory endurance, we speak more of the body as a whole. Though cardio-respiratory and muscular endurance overlap since the body is the complete unit of movement, the former becomes the more important aspect of physical fitness. When physical condition is suspect and fatigue sets in too quickly, muscular strength diminishes as does neuromuscular coordination, concentration and alertness. To prevent this and to correctly train the athlete we need to increase the mechanisms required to harvest and utilize energy supplies for prolonged movement and to concomitantly increase the distribution of nutrients and oxygen throughout the body to sustain this movement. It may seem quite unfair that what takes the body so long to develop is most easily lost with de-training. In swimming we use the expression "losing your air" because air is what is mostly perceived to be in short

supply and which becomes of primary concern while moving quickly through water over a distance of 100 yards/meters or more.

Muscle tissue is composed of two gross types of fibers, slow-twitch and the larger fast-twitch. The fast twitch fibers are further divided into all-out fast-action (Fb, which have no blood supply and are whitish in color) and a somewhat slower fast twitch (Fa which has some blood going to it and is reddish in color). The larger fast-twitch fibers are the ones that contain the potential for developing most of the strength and power. Where there is no blood supply there is greatly diminished endurance since no respiration, no waste removal and no continuous supply of nutrients can occur. The slow-twitch fibers have the greatest blood supply and are the ones most induced by endurance training. They can grow up to 22% larger than the fast-twitch fibers under this type of stress. Even the slower type of fast-twitch muscle fiber, with more oxidative capacity than pure fast-twitch, can be made to enlarge and somewhat convert over to endurance. Along with this change in fiber type, we can see a second adaptation to endurance training: an increase of up to 15% more capillary induction (blood supply) to slow-twitch fibers with all of the advantages mentioned above. This can show itself when a sprinter trains mostly endurance (if you can force him to do it). Some of his power fibers will switch over to fire more slowly but for longer periods of time; this will lessen his power output and corresponding all-out speed somewhat but add endurance so his event selection can expand somewhat, and he will stay stronger longer.

A third muscular adaptation to endurance is the increased formation of myoglobin. This is an iron-containing protein combining with and carrying all-important oxygen to the muscles' contractile fibers. With appropriate aerobic training, muscle myoglobin can be increased in muscle fibers by an amazing 80%. The more oxygen myoglobin can bind, the redder it becomes which adds additional color to these fibers already coming from the blood supply.

Oxygen needs to go where it can do the most good, and that is right to the mitochondria where all the energy to move muscle and the body is manufactured. The greater the number of mitochondria the muscles can produce the greater their oxidative (respiratory) capacity. And this increased number of mitochondria (the fourth adaptation to aerobic training), allows for increased energy production throughout the specific muscles being trained. Again, specificity of training. Only those muscles being trained regularly will produce more mitochondria. This is the goal of much of our training: work the main muscle groups needed to power the athlete through his event's requirements, but don't ignore the ancillary groups that can be used to support the whole body through various movements. Total body development is key to superior athletic performance.

It takes vigorous exercise to better induce mitochondria to enlarge, multiply, and perform efficiently. But the coach and athlete need to understand this important adaptation: as the production of mitochondria progresses to where they split and double in amount (they do not all do this at the same rate) those doing the splitting temporarily lose their ability to provide energy. The athlete can feel as though something is wrong...that he is undergoing a set-back in

training where he feels heavy or sluggish or fatigues more easily. This is only a temporary condition until all the new mitochondria mature and become able to donate to the aggregate energy supply.

The fifth adaptation to occur in aerobically-trained muscle is their enhanced ability to utilize free fatty acids (FFA's) for energy, sparing more of the carbohydrate stores until later in the event or training session for fueling speed.

The cardio-respiratory system's response to endurance training is even more encompassing. TWO major systems (called the oxygen transport system) are induced to adapt to delivering oxygen and energy in greater supply per unit time. The cardiovascular system adapts by having the heart increase in size (weight and volume), the left ventricle's wall increase in thickness and the ventricle chamber itself growing larger. This cardio hypertrophy (increase in size) due to endurance stress allows for greater filling between beats (diastole), and the increased muscularity of the ventricle's walls permits the heart to push out more blood with more force (positive inotropic effect) with each contraction (systole), producing an increased stroke volume (SV). We call this an "athletic heart." The heart is enlarged but done so appropriately due to its adaptation to increased circulatory demands. Usually, the larger the athlete the larger the heart with greater stroke volumes. As training continues, the heart rate (HR--chronographic effect) goes down at rest and in sub-maximal activity because it becomes more efficient at filling and pumping out blood. But a well-trained heart can also produce an increased maximal heart rate (HRmax) when demand requires. Several studies have shown that an average of one beat/minute per week is dropped as cardiac condition improves. After six months or more of dedicated aerobic training some responding athletes can drop their resting heart rates by 20 to 30 beats per minute or more. But we also see in older athletes (60 years old and greater) that many have developed the ability to safely increase their maximum age-appropriate heart rate when exercising intensely to allow more blood to go to the various organs of demand. All-in-all, cardiac output CO-how much oxygen-carrying blood leaves the heart per minute) is determined by multiplying stroke volume times heart rate: $CO = SV \times HR$.

There is another determinant to condition: how much oxygen is extracted by the various tissues. This is quantified by determining the difference in oxygen content between arterial and venous blood and is signified by: $a-vO_2\text{diff}$. If we put all these formulae together, we have the best laboratory method of determining a person's aerobic condition: Maximal oxygen consumption ($VO_2\text{max}$) which shows the highest rate of oxygen consumption attainable for an individual during maximal or exhaustive exercise. In fully-matured athletes, the highest attainable $VO_2\text{max}$ is reached within eight to 18 months of dedicated effort which indicates that athletes have genetic limits to maximal oxygen consumption. When $VO_2\text{max}$ is reached during very intense training, exercise quality is nearly over due to the end of the body's ability to supply oxygen to the exhausting muscles. The body may be able to hold on for a short time past this marker but that will deplete any anaerobic reserves present, and we need to bring in mental toughness.

VO₂max is usually highest in the sport-specific activity for which the athlete is training. Running hard will NOT help you in the water, but we do see moderate positive cross-over effects established in the various energy systems when going from swimming to other activities. Unfortunately, the more time spent in a gravity-free environment (swimming) the less the body can fight gravity on land without feeling the physical stresses at the articular areas (joints).

The swim sets that can stress the aerobic oxidative enzymes the most without completely wiping out the athlete training hard are any repeat distances where the rest is less than the time it took to swim. Utilizing a quick rule of thumb, taking five seconds rest per length swum or kicked will provide the necessary aerobic challenge to develop the oxidative enzymes necessary to increase endurance. Distances of no more than 300 yards/meters work best with the stated rest-to-work ratio. Many coaches will argue that offering their swimmers the opportunity to take one minute's rest after each 300 yards effort is much too long and won't challenge the athlete sufficiently, but in fact it will provide enough time to allow sufficient recovery to push several repeats with enough effort to produce all the adaptations mentioned earlier. When we shorten the repeats to 75's or 100's with only 15 to 20 second's recovery, the rest becomes more in line with what coaches and athletes deem appropriate. We can also get the necessary muscle fibers involved without completely exhausting them if we mix freestyle and stroke in different ratios throughout the set. Backstroke complements freestyle very well (both long axis movements) while breaststroke and 1-arm, alternate arm and two-arm butterfly work the core in similar fashion (short axis movement). Of course, any mix that proves appropriate for specific events would train the swimmer correctly. The use of swim fins has proven very beneficial when the athlete and coach understand the physics of their use. Going beyond the obvious of being able to hold stroke for more yards with fins, moving through water more quickly with their use produces oxidative demands greater than swimming and kicking without them. Of course we don't want to create fin-addicts, but utilizing fins appropriately can only produce beneficial results.

As touched upon earlier, an increase in blood flow to many organs is a concomitant positive inducement from endurance training. This increase is one of the most important factors for increased aerobic endurance capacity and performance. It is due to four major factors: (1) increased capillary innervation to muscle, (2) existing capillaries are opened wider, (3) a redistribution of blood which translates into more blood being directed to the muscles, and (4) increased blood volume. This last adaptation allows for increased stroke volume which allows for increased VO₂-max...there is a cascade effect where each physiologic adaptation is related and contingent upon another.

The more intense the training the greater the increase in blood volume. Blood plasma volume increases due to the kidneys spitting out more anti-diuretic hormone (vasopressin) and aldosterone. These are secreted to retain water which increases blood plasma. Aerobic exercise also increases the formation of plasma proteins, mostly albumin, which controls osmotic pressure in the blood by retaining more fluid. Aerobic training also make more red blood cells (RBC) but as more of these are produced, more

plasma is generated. Thus by virtue of dilution, we see the RELATIVE red-blood-cell concentration go down along with the hematocrit which is an important marker of oxygen-carrying red cells available. What someone ignorant of sports physiology would see would be a picture of relative anemia..."sports anemia." Where in reality there is no anemia because the ABSOLUTE number of red blood cells has been increased from base line because of aerobic training.

The other major group of organs enhanced by aerobic training, the respiratory system, can be enhanced to a greater percentage increase than cardiovascular function. Exchangeable air and the ability to do so increase astoundingly within a few months of dedicated training and continue to rise to the athlete's innate potential. Though respiration while at rest or with easy movement does not increase in functionality with aerobic training, the ability to exchange air (tidal volume) definitely rises consistently during maximum aerobic effort as does the respiratory rate; this is because of increased usage of respiratory tissue, its flexibility in function, increased activity of the skeletal respiratory muscles of the chest (intercostals) and the increased vascularity for enhanced O₂ and CO₂ respiration. What works best to enhance this in the water is to have the swimmer hold his breath while streamlining and kicking hard underwater, then having to kick and swim at the surface forcing the body to deal with increasing amounts of the one element that will limit all movement... the buildup of CO₂. This waste product of oxidation causes the brain to center only on being able to rid itself of it... at the cost of everything else. But having the body also develop physiologic buffers to combine with and neutralize CO₂ allows the swimmer to push on in a challenging set to prepare for the "combat" of racing. I do not recommend breath-holding while swimming. This causes the athlete to rush the strokes to get to the next breathing cycle. Getting the best air-exchange during most of the event is the smart physiologic play. This will allow a stronger finish since all swimmers slow down toward the end of their race. I would opt for my swimmers slowing down LESS than anyone else...if we are ahead, it is harder to get caught; if behind, we have a fighting chance to get our hands on the wall quicker.

Strength

Though strength-gaining (resistance training) can be sought along with the rigors of capturing endurance, it is not advisable to seek both with the same intensity at the same time. Putting in serious time at resistance training can actually hinder the development of endurance. But adding it gradually to the overall regimen of building the body will only serve to quicken what I call being in shape. Why seek out strength? Why devote time and effort to even visit the weight room? Because a stronger athlete can do the same tasks with less effort. This translates into less fatigue over time. Strength is synonymous with muscle, but we must also create strong areas of the body that are intimately involved with muscle. The integument (connective tissue around the joints) must be made to adapt to handling increasing resistance, otherwise inflammation can ensue along with tearing and weakening. Tendons (connecting muscle to bone) must be allowed to adapt to handle stronger and thicker muscle fibers made bigger by strength training; if not, they will be pulled from either the muscle

or the bone as the too-strong muscle goes through its function of contraction.

To build strength, the intensity of exercise has to increase and only through a limited number of repetitions with more rest and recovery in between sets. The more the resistance, the greater the stress on muscle tissue. And when muscle is first stressed and intentionally "injured" (broken down), satellite recovery tissue (myogenic stem cells) is called into play to accelerate muscle repair and regeneration. The initial breakdown leads to rebuilding to a greater size causing first hypertrophy (enlarged muscle fibers due to positive protein synthesis) and then hyperplasia (actual splitting of muscle fibers which then enlarge to produce an absolute greater number of fibers). But Nature also provides a protective mechanism embedded within muscle tissue to prevent tissue damage if too much force is generated...autogenic inhibition. Resistance training can inhibit this inhibition...a good reason to take care in the weight room to prevent musculoskeletal injury.

There are two kinds of hypertrophy: transient and chronic. The former only lasts a few hours and is caused by fluid being pumped into the exercising muscle groups. Chronic hypertrophy is the type that lasts and takes the longest to develop since it is caused by actual increased tissue development over time.

Muscles were made to contract, but they have to elongate to get to recovery position for the next contraction. It is this elongation, eccentric movement, under stress which produces both the most muscular discomfort and the greatest enlargement of muscle tissue per unit time. The discomfort is something we call delayed-onset-of-muscle-soreness (DOMS) and which can manifest itself anywhere from four to 48 hours after intense exercise.

Resistance training also causes the body to produce more nervous tissue innervation directly into the muscle fibers in the form of motor-neuronal units. This happens early on in strength training (the first 10 weeks). Then the above-mentioned hypertrophy and hyperplasia lead the way to increased strength with the neuronal innervation still of some importance but now diminishing. When more of these units are functioning, more muscle fibers can contract simultaneously to produce more force. Nature has also provided that not all our muscle fibers contract at the same time with the same intensity. If this were not the case, our ancestors wouldn't have had any innate endurance to allow them to run for the trees and not be eaten by saber-toothed tigers. But with resistance training, we cause more muscle fibers to contract at the same time for more immediately developed force. This premise allows some athletes to become quite strong yet not have a huge muscular build.

Power

This is our destination: to become powerful athletes. We become truly physiologically in shape when we can move through the sport-or-activity-specific requirements with speed and grace. Training for power should be as sport specific as possible. Athletes have usually worked very hard to get here...all to make it look so easy while competing.

$$P \text{ (power)} = \frac{\text{Force} \times \text{Distance}}{\text{Time}}$$

Power is the explosive aspect of strength; it is the product of strength and speed of movement. Usually as strength increases, power ensues quickly with appropriate training. The more power we can develop the faster we can move through water. But how the athlete trains in the weight room or on the field or in the pool will dictate how much power he can be made to develop. Moving heavy resistance is not enough. Moving heavy resistance quickly but under control is what develops power. Sufficient rest and recovery within power-training bouts and between them is even more important than trying to build strength. Maximum power can not be generated if the power fibers are not allowed sufficient time to completely or almost completely recover. A good measure is being able to move an ever-increasing resistance through an exercise in one second and to bring back the weight under control in the same amount of time. The longer it takes to move a heavy resistance the less the power element is brought into play.

Some athletes are gifted from birth with a greater percentage of fast-twitch muscle fibers. Most of us have about 25% pure fast-twitch throughout our musculature. Fast-twitch are the largest fibers in muscle and react the quickest when voluntarily caused to contract. The fastest fibers have no blood supply so their constant ability to produce energy and remove waste is greatly limited. But the slower type of fast twitch fiber, as mentioned earlier, can be made to increase blood innervation which does two things: (1) it increases the power ability of the athlete to hold for a longer time (a good thing), and (2) the absolute amount of potential power able to be generated is somewhat diminished (not a good thing). The positive aspect, again, of all this is that the increased power produced, though not at the absolute maximum, can be held over a longer period of time so the athlete has the ability to pursue his power event stronger and longer to the finish. Fast-twitch (power fibers) also retain their ability to produce power much longer (up to six months) during de-training than slow-twitch fibers which noticeably lose their functional aerobic endurance within two weeks of inactivity.

When pushing the body through bouts of power-generating activity, the athlete is also intentionally creating chemical buffers at the cellular level. Lactic acid is knowingly formed, created as a result of anaerobic (lack of oxygen) energy production. The body is stimulated to form bicarbonate buffers (-HCO_3) to absorb this acid, eliminate it through the kidneys, and delay paralyzing acidosis. This physiologic adaptation will only occur when the body is pushed way past its comfort zone. Quality athletes are formed only when pushed way past their comfort zone... over and over again.

Getting in good condition is a relative thing. Almost everyone has the innate ability to rise to their optimum level, but most who commit to enhancing their physiologic condition will stop short. For those who have "seen the light," they will have to work longer and harder to continue on to capture the three elements of physiologically being in shape: Endurance, Strength, Power. ■

The Art of Decision Making

By Kamal Vinodrai Shah

Each and every day we are tested on how we make the right choices in life. Nature is very clever as it ensures that each and every human being, no matter how evolved he or she is mentally, spiritually and emotionally, it will keep testing you on a daily basis. At every moment in our professional and personal lives we are faced with decisions one after another that create and move along the landscape of our lives. What criteria do you use to make good decisions, what benchmarks do you employ to measure your decision-making process?

Regardless of what business we are in, what projects we are working on or what interests we have in the world, we are all in the business of relationship building. In business we are always cultivating relationships with employees, with prospective clients, with colleagues. In our personal lives we want to ensure that each one around is well taken care of in terms of their vested interests and each and everyone around is in a win-win situation. The issue of relationships and decision-making are closely linked.

As human beings we need to be in close, clear contact with our own being, i.e., understand ourselves better, so that we can tune into our wisdom that we have gained with life experience. Whatever decisions we make have an impact on our lives as they keep us moving along a path that is aligned towards integrity, values and goals. When we allow the rush of events to disconnect us from these deeper desires and dreams, then we do always feel emptiness inside us. We live in an environment that is constantly changing and it is very important to understand that sound decisions will not only create a life having meaning but also ensure that you are making the necessary impact on the people that surround you. So how does one cultivate this essential connection or relationship with oneself as well ensure that those decisions that are made are sound and in tune with nature?

Most of us must have learnt that it is good choices that will ensure good decisions are made. But how do we make good choices? Here is a route to ensure that whatever choices you are making or need to make will ensure that good decisions are made in both your professional life as well as personal life.

- 1. Is this choice creative:** A good choice calls on your creativity, your interest in finding solutions that may have been hidden. Additionally it makes you have a feeling of ownership and a sense of satisfaction that you have been able to solve the challenge you are facing currently and you can feel the energy of your creativity being engaged.
- 2. Is this choice healthy:** We are all faced with a decision as to what is the healthiest route both for you and for those involved and perhaps even for the future. When making healthy decisions one has to evaluate how the impact will be for future generations to come. Furthermore, we live in an era that focuses on making short-term decisions that are detrimental to the entire

situation further down the road. So therefore make the right choice with the long-term in view.

- 3. Is this choice Open (also: Opportunities, Objective):** Does the decision keep you open to possibilities? Does it bring in a larger field of opportunities? Are you able to make it an objective as opposed to an emotionally reactive state? It is very important to have a balance of both the mind and the heart so that you do not leave with regret or be hard on yourself on what has transpired.
- 4. Is it Inspiring:** Inspiration is usually the outcome of a good decision. Even if the solution is difficult or the next steps hazardous, you know that you are doing the best thing possible in the situation. This leads to your self-esteem being boosted and raises the energy to face the situation head-on rather than evade the present circumstances you are experiencing.
- 5. Is it Empowering:** At the end of the day, do your choices leave you feeling empowered? Additionally you are the author of your own life and the decisions that you make in your life. If you do get caught in a web of confusion then you need to step back and begin to attend to the issues at hand.
- 6. The impact on the mind and soul:** Finally, choices utilize your connection between the mind and soul. Therefore it is important to have a clear understanding that whatever decision you have made is aligned towards equanimity rather than swaying towards either the mind or the soul. Life is about balance and decision-making is the same.

Once you can ensure and implement the above you will be able to maintain a stronger connection to the core in you and there will be a sense of strength and power that comes forward in your relationships and choices. Therefore, the process of decision-making takes into account facts, weighing of potential outcomes, and the history of the issue at hand. It is very important to ensure that your thoughts, clarity and connection to a deeper well-being is balanced to ensure that choice that you have made is sound and aligned to your values and principles of life. Additionally, when you make a decision it will have an influence directly on your perceptions, understanding, openness to options and solutions, and the flow of your creative juices thus giving you a deeper understanding and wisdom.

Once you have cultivated the above there is a more essential connection, which makes it easier to see, or sense what is needed in the situation. Therefore, we experience personal power to stand firm in the face of conflicting opinions or forces. Additionally, we can keep a perspective that serves the situation and begins to move it along in some creative and hopefully affirmative way that we have envisioned in solving the situation. Decisions will never stop and it is important that whatever you are currently facing in life that you apply the simple principles that will ensure you have a better quality of life. ■ **"No one can defeat us unless we first defeat ourselves."** Dwight D. Eisenhower.

Dealing with Adversity/ Failure in Life

By Kamal Vinodrai Shah

Man's character is defined when he faces adversity or failures that he/she experiences in life. Most of us as human beings will want to associate with people who are successful, positive, calm, charismatic, friendly and have many more characteristics, but we rarely see these successful people when they have been hurt by life or failed in life. These are the same people who have managed to deal with adversity/failure and come out much stronger and resilient to life. How have they done it and what is different in terms of the avenues they have used to ensure that they become mentally, emotionally and spiritually stronger?

Life is very funny. When you are busy making plans and telling nature that this is what you intend to achieve, you suddenly come across an unforeseen roadblock. Are these roadblocks to make you stronger or change the direction of the path that you have made the decision to take? Additionally, when you are facing this roadblock you tend to focus so much on the problem and challenge at hand and ask the key questions "Why does this have to happen now when things were finally getting all together?" or "Why me and why not someone else?" These are pertinent questions of life but the key question is how to deal with adversity in life. These adversities could be a romantic relationship changing its course, business ventures that have failed, or retrenchment from a company, loss of loved ones in terms of death and many others. Additionally, these failures that we face determine the way we are going to grow from life as well become wiser. If you are not facing challenges and failures in life, you are not growing.

How does one deal with these adversities or failures? Firstly, they take responsibility rather than blaming others for what is happening. Most of us blame circumstances or events for what is happening to us as human beings. We have a mindset to point fingers towards the external rather than ask, "What actions did I take to ensure for this event to take place?" Additionally, they focus on what they have learnt from what has transpired as a failure to them in their lives and learn from life. Secondly, they learn from each mistake. Mistakes and lessons are part of life. We are all human and it is human to fail in life. One must fail forward rather than fail backward in life. Thirdly, they know that failure is part of the process for progress. If you are not failing or making mistakes in life then you are not progressing in life. Most successful people have had many failures in life but it is how they have tackled these failures that has determined their success. Fourthly, they maintain a positive attitude. No matter what the circumstances one must always be positive in life and resilient to life. The more resilient you become in failing, the more you will realize that your inner strength increases as well as the abil-

ity to overcome certain setbacks in life. Fifthly, take new risks. One must always keep looking at seizing opportunities in life. We all fear failure but we need to confront that fear in life. The more you confront the fear you will realize it is not as bad as what you had anticipated. Sixthly, keep persevering. Never give up in life. Finally, they think that something did not work. They analyze the problem that they are currently facing and ensure that they get a reason for why certain things have not gone according to plan. Nature would provide answers with time if at the current time you are unclear about the way life is unfolding.

As you move forward and deal with the adversity that you are currently experiencing, it is important to also remember that there is something greater out there for you to experience in the near future. Do not lose hope and keep striving in life. ■

Here is a poem that will inspire to overcome adversity.

Don't Quit

When things go wrong, as they sometimes will,
When the road you're trudging seems all up hill,
When the funds are low, and the debts are high,
And you want to smile, but you have to sigh,
When care is pressing you down a bit,
Rest if you must, but don't you quit.
Life is queer with its twists and turns,
As every one of us sometimes learns.
And many a person turns about,
When he might have won had he stuck it out,
Don't give up though the pace seems slow,
You may succeed with another blow.
Often the struggler has given up,
When he might have captured the victor's cup;
And he learned too late when the night came down,
How close he was to the golden crown.
Success is failure turned inside out,
The silver tint of the clouds of doubt,
And you never can tell how close you are,
It may be near when it seems so far.
So stick in the fight when you're hardest hit,
It's when things seem worse,
That you must not quit.

Author Unknown