

# The World Swimming Coaches Association Newsletter

Vol 11 Issue 4

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## Carlile Sign

One of the most famous signs in the world of swimming.

Laurie Lawrence, left, Forbes Carlile, right.

This sign hung in Forbes Pool at RYDA for 40 years.

At Forbes 75th birthday party, the Carlile's auctioned it off for charity.

Laurie bought it . . . JL forced the price VERY high . . .

At Forbes 90th birthday, Laurie gave the sign back to Forbes.

This sign tells what coaching is all about. •

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# British Coaching Awards

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SOLIHULL, UK – The British Swimming Coaches Association (BSCA) handed out its 2011 Awards this past weekend in Solihull, England, as part of the 48th BSCA Conference. Coach of the Year honor was shared by Sean Kelly and Bill Furniss. Both were cited for their work with 2011 World Champions: Kelly's coaching of Kerri Anne Payne (10K), Furniss for his work with Rebecca Adlington (800 free).

Other coach of the year honors went to:

Disability: Mick Massey

Youth: Laurel Baily

A write-up on the awards presented, which includes additional award recipients, can be found on the BSCA website. •



Sean Kelly (second from left) and Bill Furniss (third from left) show their **2011 BSCA Coach of the Year awards**, alongside BSCA President Dave Haller MBE (left) and Christina Crook from Speedo (right).

# Let's Work to Clean Up This Mess

By John Leonard

Here's a surprise...I'm going to be blunt and to the point.

Those who are going to be offended should be embarrassed and I have no regrets.

There are places in the world where national swimming federations are cheating their swimmers, cheating their coaches and retarding development of swimming in their nation.

This has been going on for a long time. It is time that coaches do all they can to stop it.

## Here's how it works

FINA gives the Federation money to send both 2 athletes and a coach and a federation member to the World Championships at FINA expense.

The Federation Member decides he'd like to take his wife/girlfriend/boyfriend/husband/son/niece/nephew, or friend, to Shanghai, or any of the other fine sites where FINA hosts championships. He uses those FINA tickets to get free rides (and rooms, etc.) for those he wishes to favor.

At the same time, the Federation Member tells the swimming population that FINA has NOT provided any support for the World Championships, and tells swimmers and coaches that they can PURCHASE an airplane ticket and hotel room to go compete in the world championships.

Coaches/Athletes and their friends scramble to find funds to support an athlete or two. This is completely without regard to who the best national swimmer might be. Whoever can pay for the tickets (and perhaps a further "consideration" to the Federation) takes those places at the World Championships.

So the Federation head has a nice free trip to a nice city with their family/friends, and athletes who have not EARNED a spot as intended by FINA (as the fastest swimmers in their nation) get to swim at a World Championship Event.

Meanwhile, many lament the fact that swimming in "X" nation is not "progressing." No, of course not. When you know, as an athlete and a coach, that WINNING and being the fastest swimmer in your nation will NOT be certain to get you to the World Champs, all motivation is lost.

Competition is meaningless. It's all about who can come up with more money to give the Federation. If you've got the money, the Federation will get you the slot on the team roster.

This has been going on for DECADES. It keeps our sport from developing, and may well be the single largest thing keeping third world swimming nations, AS third world swimming nations.

Demand honesty. Speak out loud and long when the "wrong people" get sent to meets. Protest in writing to your Olympic Committee.

Reclaim our sport.



John Leonard

PS: FINA is helpless to do much about this.

Anytime FINA seeks to interfere in the internal affairs of a Federation, ALL the Federations raise a holy stink about it and they should. No nation should want FINA to tell them who to send to the World Champs. But when Federations steal FINA Funds for their own personal benefit, and athletes who have rightfully earned a place in the World Champs are cheated, we all lose. So we all need to speak up. •

# The Emotions of Coaching: Part 2

*By Charlie Dragon, Head Age Group Coach, Peddie Aquatic Association*

[www.swimmingwiththedragon.blogspot.com](http://www.swimmingwiththedragon.blogspot.com) / Twitter @SpeakDragon

In part 2 of this series on the emotions of coaching, I want to explore the issues new coaches face, and the particular emotional characteristics needed to work effectively with teenagers. I think both topics connect around trust, because trust takes time to build and the older the athlete, the longer that process.

As coaches we are often in the position of changing teams, or changing roles within a team. And because of that, the kids we coach, especially the teenagers, have many years of history with other coaches. We do not coach in a vacuum, and their history of good or bad experiences with previous coaches is always at work in the present moment – the past is always with us. For those of you who have been running your system in the same place for 5 or more years, you do not currently face the same challenges, but new assistants may.

A new coach (and by “new” I mean having worked for a team for a year or less) has to win over the trust of the athletes. Do not confuse trust with how much they like you. The swimmers may like you as a person before trusting you as a coach. Until they have a track record with you, or until you have a track record with other swimmers they know, they will be unsure of your effectiveness. This isn't usually a calculated, cognitive skepticism on their part, it's emotional. And it's also historical, they are likely to have had at least one coach prior to you that they succeeded with, and that coach will be their standard. And do we not sometimes do the same to them? We probably have had athletes in our past who did very well under us. Do they not become the standard by which we judge our new athletes? Neither mindset is fair or useful, the more you (and they) can start fresh with a blank slate, the faster a real connection can be made.

The new coach must be aware of this dynamic and appreciate that only an accumulation of good coaching over time will build trust. The new coach must be patient with the kids and not take comments like, “The old coach told me to do it this way” personally. The past is always present and so you must understand that as they learn your new ways.

Part of trust building are “tests” the athletes will put you through. I use quotes around tests because they may not be testing you consciously, but they are doing it. They will see if you are consistent in your rules, your promises and your reactions. It's imperative to be consistent with kids of all ages. Don't say, “We will start this set over if anyone doesn't streamline” if you aren't prepared to start the set over! And if you make that rule not just for today but always, you really better be ready to stop the best set of the season! You can't lecture them about treating each other with respect and then join in when they are teasing each other or making jokes. You can't say “no cursing” and then not call someone out after they curse – what you allow, you endorse. Threats or promises that aren't kept break trust. This is just like the back and forth they have with their parents, testing boundaries, testing resolve, and that is all a natural part of forming their own self-identity. I've found the better athletes actually do more of this. The most obedient, most cooperative kids are often lower performing on average. A group of sheep isn't the best group.

As a side note, almost all of this applies to the parents as well. Their good or bad history with a previous coach (or with the club in general) is always at work in your interactions. Some will be thrilled the old coach is gone, some will be mad, and some will test your resolve. Youth factors into that as well, the younger the coach, the longer it

takes for the parents to respect you. Do what you say, and say what you do. Be fair, friendly and consistent.

With the athletes on deck, beware of overcompensation. Say you want to prove to them you are a good coach, so you keep referencing the success of kids on your old team. Do that often enough and they'll think you don't value them. Or say you want them to believe you know the science of swimming, so you talk over their heads using big terms. Keep that up and they will tune you out. Or say you want them to like you, so you make lots of jokes and tell funny stories. Too much of that and you have a group that sees you as the "easy coach." Or say you want them to think you are tough and that they must respect you, so you yell and punish and snap at them. Too much of that generates hatred. Overcompensation is a manifestation of insecurity. Examine that, address it in yourself, and you will be a better coach.

The athletes will also judge you based on how the experienced staff talk about you, talk to you and act around you. You may not be able to control that, but you can control your reactions to them. It's easy to act friendly toward the other coaches you like, but perhaps the one you don't get along with was the favorite of the best swimmer in your new group. The swimmers judge you against their histories and the attitudes toward you by people they respect.

There is certainly more to talk about regarding the challenges of being a new coach, but let's move into the emotional challenges that are particular to coaching teenagers. I'm thinking more senior age swimmers here than the 13-14s. If I had to put my finger on the emotional challenge that is front and center each day with a teenager, it is "attitude." Some of them are blessed with positive attitudes; they smile, they work hard, they make jokes, they listen, they are respectful, which makes them the ones we like to see each day. In others, the attitude can range from grumpy/whiney, to sarcastic/not caring, to downright hostile. What's a coach to do with all this in his underpaid, over-worked, face every day?

When Bobby Cox, the long-time manager of the Atlanta Braves, retired after the 2010 season,

he was asked by a journalist what advice he would give young managers coming up. He had a one word response: "Patience." You must have great patience. And you must have perspective on where they are at in their own lives. It is a bit cliché but nonetheless true, you don't know what's been going on in the past 22 hours at school or at home. They may feel like they deserve a pat on the back for even making it to practice that day, and then when you hammer them on their bad attitude, it's going to get ugly.

I don't know about you, but looking back I must have been unpleasant to coach in high school. I won't get into all the reasons for that, but trust me, I was no ideal swimmer. Were you? Actually, if you were, if you were the apple of the coach's eye, if you were really fast and hard working and the team captain, and if you won the award for "best guy ever" at the end of the year, I'm not sure you will make a great coach. Well, maybe you will, but you will have to work hard at understanding the rest of us who were jerks as teenagers. I can only imagine how frustrating it must be to be you and see all these kids who you were better than as a swimmer, and a person, constantly screwing up, yet again! Empathy will be your goal.

For me, and for most of you, just try to remember what it was like to be that age for a little while. Let all those negative memories come flooding back and you will start to be less reactive to their attitudes. And that's the key, less reactive in the moment. Accept their failings and shortcomings, accept them as people whose brains are far from fully developed, whose judgment is impaired, whose life experience is tiny, whose identity is not set, and whose main goal is being liked by the other teenagers. If you can do that, then you can relax, be patient, be yourself more fully, and keep the focus on instruction, correction and motivation.

I know some of you are squirming right now thinking, "This is some touchy-feely nonsense. Our job is to make these kids better swimmers, better people, improve all those things you just said to accept. This is sports, you got to be tough to win!" Well, I agree actually. I think the best way to change someone is to bring them closer, not reject them. You accept them as people, with

their faults and all, and then you nudge them to be better than they are. You nudge them every day, and if they don't interpret what you are saying as a rejection and devaluation of them as people, then they will be more likely to change.

When a teenager really gets under your skin, try to take a step back and look at him/her as a child. When I would coach 9-10s, another coach and I of the same age group would always remind ourselves (and the parents) "they are only 10!" when our expectations would get too high, or our frustration would boil over. Well,

that teenager is 16, and don't forget that while he may be as big as an adult, or try to talk like one, he is still a child.

9 out of 10 kids are doing their best each day, and what we are trying to do is teach them to reach past their current best to find out they can do way more, be far better, and be much faster. The motto of the Leadville 100 mile ultramarathon is, "You are tougher than you think you are, you can do more than you think you can." Accept, instruct, correct, motivate, and be patient. Repeat daily. •

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# How to Swim Faster? Practice BETTER.

*By John Leonard*

Lots of coaches of novice groups ask me the question above on a regular basis.

The "Practice Better" answer is facile but is also entirely true.

The question of course is what makes a "better practice."

Here's my simple responses:

#1. Teach Correct things.

#2. Teach and especially demonstrate them, CORRECTLY. (You would not believe the number of coaches who demonstrate something on land and the demonstration is incorrect. The swimmers see it and copy it perfectly!)

#3. REPEAT ENDLESSLY. – practice does not make perfect. Perfect practice makes perfect. We know from the rule of 10,000 hours of practice to make expert, that repetition is the mother of all learning. So make sure the repeats are done correctly, or stop, fix them and begin anew.

#4. Since we're looking for quality repetitions, novice teams should use a 12 yard pool or across

the 25 yard pool whenever possible to get the maximum number of well done repetitions and the minimum amount of incorrect "struggle swims."

#5. Engage the athletes with personality, pace of practice and ASKING THEM QUESTIONS to test their learning. It's all about the coach doing a good job!

#6. Feedback should be short, pointed, evocative of a good word picture in the mind of the athlete and IMMEDIATE. Good feedback is good coaching. (John Wooden)

#7. Remember that something that is learned is First learned Purposefully and thoughtfully . . . (You think about what you're doing.) Next stage, is "mindless" – set the picture of the act in your mind, then turn off the brain and let the subconscious take over and execute. The final stage is "under pressure." When you are tired, can you still execute the same movement . . . mindfully or mindlessly . . . doing it well "UNDER PRESSURE OF FATIGUE AND STRESS" is the real test of what you have learned. •

# The “River Rat” Who Mined Diamonds From The Sea

Geoff Grylls’s successes were not only on the surface of the water as a champion swimmer, but also underneath. He used natural skill and acumen to build a multi-million dollar enterprise extracting diamonds from under the sea in the world’s second biggest sea mining operation after the renowned de Beers Diamond Company.

*By Cecil Colwin*

In swimming circles world-ranked swimmer Geoff Grylls has long been known as a ‘River Rat’, a South African colloquialism for a person who thrives on swimming in rivers. He learned to swim in South Africa’s Swartkops River, a large river that flows into the Indian Ocean, near the city of Port Elizabeth. And this is where he later did most of his training. Like many a good swimmer before him Geoff can’t remember when he couldn’t swim. From his early years swimming has been an important part of his life. He liked being near water and was sailing his own yacht in open water at the age of eight. In the pool, while still in his teens, he began to win national and international freestyle swimming championships at every distance from the 100 to the mile. However Geoff’s successes weren’t only on the surface of the water but also beneath it. From under the sea he built a multi-million dollar enterprise extracting diamonds in the world’s second biggest sea mining operation after the renowned de Beers Diamond Company.

## **Growing Up on the River**

Talking about growing up on the Swartkops River, Geoff said that it was “a paradise, an adventurous place in which to grow up, just like Tom Sawyer’s life in a Mark Twain story. We all

learned to swim, sail, row and do all sorts of water sports like canoeing, fishing and water skiing. “

“We led a very unrestrained life, and once we had learned to swim we were left pretty much alone all day. So we explored the river, seeing seagull nests, monitor lizards, snakes etc. Apart from swimming we did a lot of sailing on the river and this also became an important part of my life.”

## **Training in the River For Big Meets.**

Throughout his competitive swimming career, even when he was a South African and British Champion, Geoff trained in the river for most of his big races. “I used to discipline myself to go down to the river and train, and hang a watch off one of the jetties in the river and swim between the jetties or across the river and back and record my times. That’s how I used to do my splits.”

Asked how he was able to measure his speed over an unmarked distance, Grylls said “I knew that the river was 100 metres across... approximately, depending upon the tide, and the distance between the jetties was approximately 50 metres. And, depending on which way the

tide was flowing, my times would be different , and so I adjusted my times for the rate at which the tide was flowing and swam against myself!"

Asked how he would know his reactions when he finally got into the strange surroundings of a marked-off swimming pool. Grylls replied: "Well, I didn't know. In fact, the week before the 1964 National Championships, where I won all four South African freestyle titles, my coach Peter Elliott, commenting on his team in the local newspaper, said 'I have absolutely no idea how fit Geoff is because he swims in the river!' . I used to train with Peter in his pool once a week and he would correct my stroke and give me time trials, but the rest of my training was done in the river. When I got into the pool, Peter merely checked my pacing and how I was moving in the water."

## **Ilsa Konrad's Reaction**

Asked whether his coach commented on what times Geoff was clocking and what chances he stood in competition, Geoff replied: "Those sort of things didn't really worry me. I had a sort of 'inner-confidence', I did the best I could. I honestly think that this attitude kept me relatively unshackled... it kept me relatively fresh. In fact, in 1966 when Ilsa Konrad, the great Australian swimmer turned journalist, was in South Africa because she found this most intriguing, she wrote a long article on how I trained in the river all alone and kept improving."

## **Swimming Alone in Open Water**

"Eventually, this type of training was to condition me later for taking up open water racing because in 1964, the English magazine, "Swimming Times" in Britain, when discussing my winning all four British freestyle titles, said that I was 'a star whose technique they couldn't fathom. He has the ability to lift his head out of the water to look around and see how he was doing in the race without unbalancing his stroke."

Grylls said that when he eventually took up surf swimming and later ventured into rough water swimming, "it was the sort of freedom

that I enjoyed. And since then, other than when I played water polo for Eastern Province and then Western Province, since those days at the end of the 1960's I've been a loner. I've trained alone in the sea. For example, beginning in 2006 when I went to the World Life Saving Championships, during the preceding six months in training I trained alone in 14 different venues in four continents, mostly in the sea."

## **'Oceanic Repeat Swimming'**

"I do train in the pool quite often now but most of my real hard training is only in the sea, and what I do is as follows: I know that I take 90 strokes for 100 metres. I have an unusually rapid turnover and so I do repeats by taking 100 strokes flat out, then taking a rest time off my wrist watch, and then I keep doing 100 stroke repeats as hard and fast as I can, taking a rest in between... it's a sort of oceanic repeat swimming!

And so all my open water interval training is done in this fashion, varying the number of strokes; 100 strokes or 200 strokes, or if I'm speeding it up, on 50 strokes. For the last nine years, my companion Shirley and I have spent three months of every year out in the Mediterranean or in Croatia, where our yacht is moored, and the only place I've had to swim in, is the sea!"

## **Training and Meeting Challenges**

Now in his sixties, Geoff is winning international open water long distance events and life-saving competitions in his age group. He takes three or four months out in every year to sail his yacht in rivers and oceans around the world, stopping to train in an inviting bay or wherever he can find a likely rough water challenge in which to swim.

## **About Geoff Grylls:**

Born 18 Sept 1943, Port Elizabeth SA

Height : 6 feet ,three inches.

Present weight: 188 pounds, but down to 182 when really training. (Grylls weighed about 165 in pounds in his heyday)

Matriculated at Grey High School, Port Elizabeth, 1961

Compulsory military training at the SA Air Force Gymnasium 1962. This Institution is very sport inclined and Grylls was given great encouragement with his swimming.

Bachelor of Commerce Degree, 1963/1966, The University of Port Elizabeth (Now Nelson Mandela University)

Named South African "Male Swimmer of the Year", in 1962, 1963, 1964.

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### 1962

Won the South African National 1650 yds title and swam for South Africa versus the visiting Japanese Team.

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### 1963

Won the South African 220, 440 and 1650 yds freestyle titles. Member of the Eastern Province Team that won the National Championship 4 x 110 medley relay and both the 4 x 110 yds and 4 x 220 yds freestyle relay titles.

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### 1964

Won every South African Freestyle title: 110, 220, 440 and 1650 yds. Also won the 4.5 mile Fish Hoek to Muizenberg swim in the Indian Ocean swim (Each swimmer had an accompanying personal board paddler because of sharks sighted in the Bay.)

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### 1964

Member of the South African touring Team to England where he won the 220, 440, and 1650 yds British National titles, but heard that South Africa had been expelled from the Tokyo Olympics. No one realized that, as a Dual

Citizen of South Africa and Great Britain, Grylls qualified for a British passport and as such, if selected, could have been permitted to compete in the Tokyo Olympics.

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### 1965

Did not swim in SA Championhips because of mononucleosis (glandular fever) and also missed the Fish Hoek Open Water swim.

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### 1965

Member of the South African touring Team to England where he won the 220, 440, 880 yds Freestyle British National titles and came second in the 1650.

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### 1966

Scaled down his swimming activities as he was working full day, studying 5 university subjects and trying to train in between. As a result, he did not swim the 1650 in the South African National Championships, but came 3rd in the 110 yds freestyle and won the 220 and 440 titles at the South African Championships.

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### 1966

As a member of the South African Team toured USA and competed in the American National Championships in Lincoln, Nebraska, where he tied with 3rd fastest time in the 200 metres freestyle but was given 4th place time. Don Schollander and John Nelson were first and second respectively in world record time. (Grylls beat the up and coming 16-year old Mark Spitz in this race in which Spitz was swimming in his first National Championships.) After these Championships Doc Counsilman offered Grylls the chance to do an MBA and train at Indiana University, but as South Africa was not permitted to compete in the 1968 Mexico Olympics, Grylls turned his back on competitive swimming and joined the Surf Lifesaving Association which, "because of its humanitarian aspects", continued to be internationally recognized. •

# Physiological Basis of Vibration Training

By Gerzadijus Sokolovas, Ph.D.

## Introduction

In recent years the popularity of using low frequency mechanical vibration in training has been growing in many European countries. Vibration training is currently a regular topic of debates at scientific conferences and coaches' clinics and many articles have been published in scientific magazines about the effects of vibration on strength and power, flexibility, balance, rehabilitation after injuries, recovery after high-intensity training, space medicine, neurophysiology, osteoporosis, and other areas. It has been reported that low-frequency and short period muscle vibration may induce improvements in strength, power, and/or flexibility similar to those observed after several weeks of heavy training. A new generation of vibration ergometers facilitates the use of this training method in many sports, including swimming.

Looking back through history, vibration as a training and treatment methodology has been known for many years. In the '60s and '70s, scientists noticed that mechanical vibration had an acute effect on blood circulation and muscle contraction reflex (Hagbarth, K.E., & G.Eklund, 1965; Coermann, R., et al., 1965; Butkovskaja, Z.M., & I.G. Boldyrev, 1967; Macchioni, P., et al., 1968; Kozminska, A., et al., 1970; Homma, S., et al., 1972; Arinchin, N.I., 1974, etc.). Russian scientist Nazarov, V.T. began to use vibration as a training tool in gymnastics and several other sports (1983; 1984; 1987). They noticed significant improvement in flexibility, strength, and power after a relatively short period of vibration stimulation. Over the years, vibration training has been called Biomechanical Stimulation of Muscles, Stimulation

of Biological Activity, Vibration Treatment, Rhythmic Neuromuscular Stimulation, Mechanical Stimulation, and Vibration Exercise. Later studies revealed the physiological mechanisms of vibration training

Basically, exposure to vibration affects muscle blood flow and energy metabolism, muscle neurons and brain activity, hormonal activity, bone density, and some other areas. The purpose of this paper is to reveal the physiological adaptations to vibration training.

## Effects Of Vibration Training On Blood Flow

It appears that the vibration effect on blood flow depends on the frequency and magnitude of the vibration stimulus. Studies in occupational medicine reveal that the use of high-frequency vibration (typically, more than 40 Hz) has a negative effect on blood flow. The extent of blood flow constriction increases with the frequency of vibration (Ito, F., 1978; Farkkila, M., & I.Pyykko, 1979; Faruta, M., et al., 1991; Bovenzi, M., & M.J.Griffin, 1997, etc.). Bovenzi, M., et al. (2000) found a significant reduction in finger blood flow with the increase of a vibration frequency from 31.5 to 250 Hz. Additionally there was also a decrease in blood flow even after the exposure to vibration had ended. Parameters of magnitude, such as acceleration and displacement (amplitude) of vibration platform, also play an important role in the changes of blood flow. It seems that at highfrequency vibration, the blood flow decreases with an increase in the magnitude of

the vibration (Bovenzi, M., et al., 1997; 1999; Luo, J., et al., 2000).

On the other hand, the low-frequency vibration (18 to 32 Hz) appears to increase blood flow (Ito, F., 1978; Michejev, E.E., & P.M.Priluckij, 2000; Rittweger, J., et al., 2000; Kersch-Schindl, K., et al., 2001, etc.). Michejev, E.E., & P.M.Priluckij (2000) attribute the higher blood flow to the effect of the “muscle pump”. Trying to attenuate the low frequency vibration on the body evokes rhythmic muscle contractions. These contractions induce the changes in peripheral blood flow by the widening of blood vessels. Kersch-Schindl, K., et al. (2001) showed that the mean blood flow velocity in the artery almost doubled and the resistive index of the artery decreased significantly after standing on a vibration platform for 9 minutes.

When muscles contract and relax at a low frequency, they pump the blood out of and into the muscles. This facilitates the removal of metabolic waste products from the muscles (lactate, creatinine,  $Ca^{2+}$ , etc.) and the delivery of fresh blood, which provides nutrients (glucose, fats, and proteins) and oxygen. As a result, using vibration might help muscles recover faster after high-intensity work and/or injuries.

## **Metabolic Changes During Vibration Training**

Vibration training causes small muscular contractions that elevate the muscular metabolism. The limited number of studies on energy metabolism during vibration exposure shows that vibration affects aerobic and anaerobic metabolism as well as creatine phosphate (PCr) sources in the muscles. Elevated oxygen uptake during the vibration training indicates an increase in aerobic metabolism. According to Rittweger, J., et al. (2001), a whole-body vibration at 26 Hz and amplitude of 6 mm requires a level of energy metabolism, comparable to moderate walking. Oxygen uptake was 48.8 % of  $VO_2$  during the whole body vibration (Rittweger, J., et al., 2000).

Studies show that some energy is released through the anaerobic pathway, as well. During

the vibration training, lactate levels elevate up to 4 mmol/L and heart rate levels reach 160 bpm. Indications are that the metabolic response depends on the acceleration and frequency of vibration: the higher acceleration - the higher oxygen uptake, lactate, and heart rate (Spitzenfeil, P. et al., 1997; Mester, J., et al., 1999; Rittweger, J., et al., 2000).

Muscle phosphate (PCr) storage is the main energy source for the short-term and high-intensity exercises involving fast-twitch muscle fibers. PCr decreases significantly during isometric contractions. Hoffmann, U., et al. (1999) showed that the decrease of PCr under vibration exposure was faster than that without vibration. This indicates that vibration exercise involves fast-twitch muscle fibers, which use muscle phosphates to release the energy.

## **Neuromuscular Adaptation to the Vibration Training**

Vibration training is a useful method for enhancing neuromuscular performance. Neural adaptation assists the coordination of the muscles by reducing the activation of muscle antagonists, increasing activation of muscle synergists, and by increasing motor unit synchronization (Sale, D., & J.MacDougall, 1981; Behm, D.G., 1995; Carroll, T.J., et al., 2001, etc.). In general, the training effect produced by vibration exposure is similar to the effect of explosive power training (Mester, J., et al., 1999; Bosco, C., et al., 2000).

Studies show that changes in the neural factors, with resistance training, occur within a few weeks or even months (Moritani, T., and H.A. De Vries, 1979; Sale, D., 1988; Torvinen, S., et al., 2002, etc.). By using vibration training, it is possible to reach the same neuromuscular changes in a much shorter period of time. Vibration training elicits the activation of muscle spindles and neural signals via  $\alpha$ -motoneurons (Hagbarth, K.E., 1973; Seidel, H., 1988; Martin, B.J., & H.S.Park, 1997; Bosco, C., 1999, etc.). Thus, superimposed mechanical vibration specific to a muscle may enhance its contractions.

The improvement of strength and power induced by vibration training suggests that neuromuscular

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adaptations have occurred. Most likely, this enhancement after vibration training is related to the activation of fast-twitch muscle fibers, which play a major role in strength and power performances. Several studies confirm that vibration training has a positive acute effect on strength and power parameters (Liebermann D.G., & V.B.Issurin, 1997; Issurin, V.B., & G.Tenenbaum, 1999; Bosco, C., et al., 1999; Torvinen, S., et al., 2002, etc.). On the other hand, at least one study revealed no significant acute effect after vibration training (de Ruiter, C.J., et al., 2003). It is possible that different vibration training protocols, such as vibration amplitude and frequency, may lead to different results.

Electromyogram (EMG) results show a significant enhancement of the neural activity during vibration training (Lebedev, M.A., & A.V.Peliakov, 1991; Warman, G. et al., 2002, etc.). An increase in the mechanical power with a decrease in EMG activity resulted after the vibration training. As a result, the ratio between EMG and mechanical power (EMG/P) decreased. This indicates increased neuromuscular efficiency – when muscles are able to produce higher power with lower activity (Komi, P.V., et al., 1978; Hakkinen, K., & P.V.Komi, 1985; Bosco, C., et al., 1999; 2000, etc.).

The reduced pain effect during vibration training may be attributed to the neuromuscular adaptation, as well. It has been suggested that superimposed vibration may elevate the pain threshold (Lundeberg, T., et al., 1984; 1988; Issurin, V.B., et al., 1994). Studies demonstrate that stretching exercises with superimposed vibration have significant advantages in helping increase flexibility over conventional methods

(Nazarov, V.T. et al., 1983; 1984; Issurin, V.B., et al., 1994). It is possible that vibration training stimulates the Golgi tendon organs. As a result, muscles can be more relaxed and flexible. Increased blood flow, accompanied by temperature increase during the vibration training, may also provide improved flexibility.

### **Hormonal Changes During Vibration Training**

It has been shown that intensive strength and power exercises evoke an acute hormonal response (Kraemer, W.J., et al., 1995; Pitkanen, H., et al., 2002; Godfrey, R.J., et al., 2003, etc.). Potentially, vibration treatment can stimulate the muscles and tendons of athletes in a way that simulates heavy strength training. A small number of studies suggest that vibration training leads to acute responses within the hormonal profile. Bosco, C. and colleagues (2000) investigated the concentrations of testosterone, growth hormone, and cortisol after vibration exposure. The testing results showed a significant increase in growth hormone and testosterone. The concentration of growth hormone increased more than four-fold, whereas the concentration of testosterone increased about 7%. The concentration of cortisol was decreased about 32% after vibration exposure.

There are relationships between the basal concentration of hormones and strength and speed performances. A positive correlation has been shown between the basal concentration of testosterone and sprint-running performances (Kraemer, T., et al., 1995; Bosco, C., 1996, etc.). It is possible that an increase in the concentration of testosterone after vibration training may

have an acute effect on strength and speed parameters (Nazarov, V.T., 1983; 1984; Issurin, V.B., 1998; Issurin, V.B., & G.Tenenbaum, 1999; Gabriel, D.A., et al., 2002, etc.).

Some studies indicate that exercise-induced hormonal responses are important for the long-term adaptation in athletes (Virus, A., 1994; Kraemer, T., et al., 1995; 1996, etc.). Most likely, long-term exposure to vibration will also lead to changes in hormonal response and athlete performance. A significant effect of long-term vibration training on athletes' strength and flexibility has been shown (Nazarov, V.T. et al., 1983; 1984; Issurin, V.B. et al., 1990; 1994; Weber, R, 1996; Kunemeyer J. et al., 1997; Micheev, A.A., & Priluckij, P.M., 1998; 2000; Bosco C. et al., 1998; 1999; etc.).

A reduction in the release of the vasoconstrictor hormone endothelin leads to the widening of blood vessels during vibration exposure (Nakamura, H., et al. 1995). That opens a door to the new application of vibration exposure. It is well known that the vibration of injured body tissue, including various forms of massage, is widely used as a method of rehabilitation. Utilizing vibration training may help to enhance the blood flow around vibrated areas. As a result, more nutrients and oxygen are delivered to, while more waste products are removed from, vibrated areas. In fact, this type of vibration treatment has been demonstrated as an effective tool in rehabilitation after injuries, bone growth, treatment of osteoporosis, and pain reduction (Lundeberg, T., et al., 1988; Chen, L.P., et al., 1994; Rubin, C.T., & KJ.McLeod, 1994; Micheev, A.A., & Priluckij, P.M., 1998; 2000; Rubin, C., et al., 2001; Roy, E.A., et al., 2003, etc.).

## **Effects Of Vibration Treatment On Bone Density**

It is well known that physical training is effective in bone formation. This is especially important for women, since bone mineral density (BMD) may be compromised through menstrual dysfunction. As a result, women are at greater risk of developing osteoporosis, which is related to a reduction in bone mass, leading to potential stress fractures

(Ivkovic, A., et al., 2001; Manore, M.M., 2002; Cussler, E.C., et al., 2003, etc.).

Studies demonstrate that high-strain physical activity is more effective in bone formation than low-strain activity (Lewic, R.D., & C.M.Modlesky, 1998; Hagberg, J.M., et al., 2001; Cussler, E.C., et al., 2003, etc.). Heinonen A. and colleagues (1995) found significantly higher BMD levels in strength and speed sport athletes, such as squash versus aerobic sport athletes, such as dancers and speed skaters. Dancers and speed skaters also had significantly higher BMD levels, in comparison with the sedentary study group. It seems that high intensity training develops stronger bones, while stronger athletes have higher BMD levels.

There is strong evidence about the effectiveness of bone formation through vibration treatment. In fact, only 10 to 20 minutes/day, low magnitude and high frequency vibration increases bone formation and growth, as well as BMD levels (McLeod, KJ., et al., 1998; Rubin, C., et al., 2001, etc.). On the other hand, 4 minutes daily vibration during an 8 month period had no effect on the bones of young, healthy adults, but did increase vertical jump height (Torvinen, S. et al., 2003). It's quite possible that 4 minutes/day of vibration is too short a stimulus to affect BMD levels. Based on the current studies regarding vibration training, in order to raise or maintain BMD the daily duration of vibration should be between 10 and 20 minutes. (see section on safety issues)

Reduced gravity in space has been proven to stimulate bone loss in astronauts. During space flights, astronauts can lose BMD levels at the rate of 1.6% per month (LeBlanc, A., et al., 1998; Ruff C.B., et al., 1999, etc.). This may lead to skeletal fractures when returning to the Earth. Therefore, astronauts have to spend about 3 hours/day exercising during the long-term flights. Studies on animals show that 10 min of vibration training might help to prevent bone loss (Rubin, C., et al., 2001). Potentially, 3 hours of exercising may be replaced with only 10 min of vibration in space.

Microgravity, the aging process, menstrual dysfunction, and post-injury bed-rest suppress

bone cell activity and increase bone loss. Vibration treatment might be used to maintain BMD levels and avoid the potential consequences of bone loss. However, future studies need to establish the optimal duration and magnitude of vibration to prevent bone loss.

## Is Vibration Training Safe?

Examples of research in work physiology, defined many situations at work where workers are exposed to vibration, include machines, boats, helicopters, trains, jackhammers, and many others. Since long-term, daily exposure to long-term vibration may be detrimental to workers' health, very strict international rules have been established (ISO 2631). For example, if a worker was exposed to one gravitational acceleration on Earth (9.81 m/s<sup>2</sup>), the vibration exposure to this level of acceleration may not exceed 2 hours/day.

The "acceleration" in this case is dependent on the frequency and displacement (amplitude) of the vibration. Most commercially, available vibration training devices will quite possibly reach a much higher acceleration and depending on the frequency and amplitude of vibration, acceleration may exceed up to 18 gravitational accelerations on Earth. Therefore, the total exposure to vibration should be no longer than 20 min/day. It is recommended users/trainers expose themselves to this type of training every other day for about 15 to 20 min over a period that should not exceed 3 weeks. However, when using a vibration device to accelerate injury rehabilitation, it can be used for a longer duration of time (Michejev, E.E., & P.M.Priluckij, 2000). Athletes are advised to not use vibration treatment if they are suffering from conditions such as: hypertonia; inflammation of the lymph nodes; suppurative inflammation; atherosclerosis; diseases of the internal organs; skin diseases; festers; abscesses and additional low incidence diseases.

Coaches and athletes need to be aware that vibration has a high impact on the muscles,

tendons, ligaments and other body organs and tissues. Therefore, it is important to stop vibration treatment if an athlete feels pain, discomfort, or any other side effects.

Vibration exposure may lead to swelling and short-term itching after the vibration exercises (Homma, S , 1973; Rittweger, J., et al., 2000). Typically, these effects are not harmful and disappear within 60 min after cessation of the vibration exercises.

## Conclusions

Vibration training is a relatively new method to potentially improve athletes' performances. Many studies show that this method might be used to increase strength, power, flexibility, and recovery after injuries. Vibration treatment is also an effective tool against the loss of bone density. Therefore, athletes may benefit from vibration training to maintain higher bone mineral density levels. This is especially important for some female athletes during the menstrual dysfunction period when amounts of iron and calcium are potentially reduced. In conclusion, swimmers may benefit from using of vibration training in areas such as:

- Short-term improvement of strength
- Flexibility, and power
- Maintenance of strength and flexibility before and during the major International meets
- Recovery after high-intensity training sessions and races
- Reduction of muscle stiffness
- Enhanced rehabilitation after injuries
- Maintenance of higher bone mineral density levels.

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# One Pool – NO warmdown?

By John Leonard

A persistent problem for most of the USA is the fact that few facilities that host meets offer a second cool-down pool. Where such a two pool set-up exists, it is constantly utilized. Some meets in one pool operate creatively, allowing a brief warmup-cooldown for a few minutes every hour or two, or event or two. Some can dedicate a lane or two in a pool to warmdown.

But most, run the meet without a warmdown facility. One of the most common questions that we are asked in Physiology schools relates to that situation.

Simply put, “what to do?”

First, remind ourselves of the purpose of warmdown or cooldown...(both terms generally used interchangeably...)

First purpose – to clear the waste products of hard exercise from our musculature. Age Group swimmers generally speaking, produce little in the way of lactate, so this does not apply much to them..they race aerobically and have little real need to “clear” lactate.

Second purpose – loosen muscles that may have “tightened” in the previous race.

Third Purpose – prepare the muscles and nervous system for the stroke (s) in the upcoming event.

So what are the options? Here are a few time tested ideas to have your swimmers consider:

- 1** Warm shower. May help loosen some musculature.
- 2** After the event, continue to move...walking, light stretching, easy calisthenics. Move for 3 times the amount of time you have swum. Longer for some “sprint events”.
- 3** If safe and available, some light cord work to mimic the strokes you will swim next. Light resistance, easy work.
- 4** Light massage by a certified and licensed massage therapist. (not many age groupers will have that luxury of course...) Coaches take note...no massages from you.
- 5** Jog about a bit before the next event to get your heart rate raised...and some more energetic calisthenics. “Air strokes” to groove the nervous system may also be useful.

Those of us with most of our competition venues with multiple pools are spoiled of course. If an age group swimmer grows up in the sport without warmdown pools, they won't miss them. Make sure you, as a coach, don't suddenly create an unexpected problem by telling them that they need one to compete properly.

Generations of athletes have been successful without the 2nd pool. Make sure they know that, if someone else raises the issue. •