**Q: You mention in this training log post that you are programming the skill work for basketball players:
http://asp.elitefts.com/qa/training-logs.asp?qid=117823&tid=145

Do you use low-intensity skill work like free throws, dribbling, passing (while keeping HR @ 120-130BPM) for cardiac work with basketball players???

In the offseason, do you ever use basketball-specific drills to develop alactic power or capacity?

And how many shots are these players taking and how many at each intensity level (120-130bpm and in aerobic development zone)?**

A: The two basketball players I work with don't wear HR monitors for their low level skill work i.e. free throws, dribbling, passing, and so on. For these sessions I limited the entire session to 45-60 minutes. Some days they might do 2-3 of these.

Yes I did for both alactic capacity/power and glycolytic power/capacity. For one of these athletes I used the Omegawave system to monitor the CNS and once he dropped below baseline levels the session was stopped. For the high intensity work it is at HR which mimic game conditions (150-180/190) so we would do 1v1, 2v2, and 3v3.

The other basketball player is an 8th grader and within the first session noticed such a marked improvement in his skill (before he was doing "skill camps" of 1-2 hrs) that they immediately took him out of it.

One of the baseball players who I worked with (a pitcher with the Chicago Cubs) was very sympathetic dominant and had a poorly developed aerobic system so his skill work was split into 5-8 pitches with 3-5 minutes of rest to view his pitching motion via video. Maximum pitches thrown were 40-50.

**Q: As a basketball player I have been training oxidative capacity of slow and fast twitch fibers, aerobic capacity, alactic capacity and power and my training is going great. My physical preparation is more well-rounded than back when I trained like a track sprinter.

The only thing is that while I am quicker and can exert force in less time than before, my vertical jump has decreased and it has affected my style of play. My standing vertical was always pretty correlated with my max half squats and I used to be able to dunk a basketball from standing. Now I can barely dunk with a run up. I am also getting pain in my patella tendons which I have not had for years.

My overall game has improved and so it was worth it to me to stop doing heavy squats and weights to concentrate on the above regimes. But now I am having pain and I wonder if it’s from weaker hamstrings, glutes, or VMO now that I don't lift really.

So what is the best way to combine weights with training everything else?

Should I just keep some 60-80% squats in to maintain strength, stabilize my knees, and increase my vertical jump?

Are 80-90% weights ok as long as all my other stuff like cardiac system, aerobic capacity, etc. are all being trained?**

A: When did the pain in the patella begin? Have you increased your amount of games/practice substantially over previous volumes and intensity?

The best way to strength train along with everything else (aerobic capacity, glycolytic capacity/power, cardiac work, etc) should be based on your strengths and weaknesses. So since your vertical jump is down you may want to focus a microcycle on increasing strength through squat, single leg squats, etc that will not hurt your knees. You could do this for 3-4 weeks while concurrently maintaining the other qualities. Here is a sample program I have used with a few athletes who play basketball.

Sunday - off

 Monday - Box jumps, single leg squat + DB, back extensions, ghr, core (15 min), oxidative squats

 Tuesday - 40-90 minutes of heavy resistance bike rides, bench press, upper body assistance work, core 15 minutes

 Wednesday - 30 min cardiac work, jumps with long recoveries, 15 min core work

 Thursday - Cardiac restoration 45-60min 100-120 bpm

 Friday - repeat of Monday session with 1/2 volume

 Saturday - either bike rides, uphill walking lunges + 45 lb bb, or step ups for 40-60 minutes.

One of the athletes I worked with improved his vertical jump from 24" to 29.6" while adding 30 lbs to his frame and his aerobic capacity improved from 117 to 124. We didn't squat at all during this period which was 5 months. We used single leg squats, jump squats with kettle bell (for alactic power/capacity), step-ups, hill sprints, and reverse hypers.

The exercise is less important as to when and why you are using it to produce the correct adaptation.

**Q: In regards to this question,

http://asp.elitefts.com/qa/default.asp?qid=120615&tid=55

how would you structure glycolytic weight work to add mass? Thanks again.**

A: Ok before I explain this method I caution anyone beginning to implement these methods that you have an extremely high level of fitness otherwise you will be sorry once you begin this work. I am not saying this to be a smart ass I am just telling you upfront, this is some of the toughest work you will ever do. I have only had 3 athletes ever perform this work using the squat, so you have been warned.

So to develop hyperplasia of fast-twitch fibers use 80-90% of 1RM, every set must be to failure. During this work you do not want hypoxia so you can relax at top. Rest period between sets is 1 minute (you must go on the minute), perform 7-10 sets. This work will produce a significant discharge of hormones and stimulating protein synthesis. Come back 4 days later and perform 1/2 the volume. I would only run this cycle for 3-4 weeks. During the week the rest of the week you can still lift, do properly programmed aerobic work just avoid anything that metabolizes hormones or is stressful on the endocrine system.

**Q: A while ago I asked you about energy systems training for basketball. With your help and some study and research on my own I believe I now have a solid understanding of the roles of each system and why they should be trained. I wonder if you can help me out with a few more questions.
I know that with regards to the alactic system, power is trained before capacity. Should the same be true for the glycolytic system?
How might one go about setting up a split for training the alactic, glycolytic and aerobic systems? Or would it be better to focus on one at a time? How (if at all) would you incorporate strength training with weights?**

A: With glycolytic work I would save this work as the final piece of the training structure. What I did this year was run all the alactic work power/capacity first while concurrently doing aerobic capacity work on the bike. Now prior to the alactic work we did a block developing the oxidative capacity of the myo-fibers with oxidative squats. Once the alactic capacity block was completed we moved into glycolytic work with running exercises, then between each session we needed to replenish the mitochondria which was destroyed so we performed these session once every 7 days. We then finalized the glycolytic capacity work with sport specific drills. With regards to weights we did strength work every 10 days to maintain.

Always remember that you must have ways to recover the mitochondria after the glycolytic work. One other note make sure you have a highly developed cardiac system in place otherwise it will be very hard to recover and adapt to this work and the chance of injury will go up.

You cannot build a house without the proper foundation so make sure you enjoy the process otherwise you will never reach your full physical/mental potential.

**Q: An update and a question - first, thank you for your advice on cardiac work and conditioning. With your help and guidance, I was able to reduce my blood pressure from 140/80 to 106/66. Everything feels better including my energy levels and how I sleep. I performed cardiac work (30 minutes to 60 minutes) 6x a week along with one longer bike ride of 1 hour, 30 minutes keeping my heart rate between 100 and 120. I continued with the prowler, albeit applying your recommendations and my conditioning has vastly improved. Again, I really appreciate the help you provided.

Now onto my question - what next? I plan to continue the cardiac work 5 to 6 times a week (30 to 50 minute sessions), but what else can I do? My main goal is getting stronger in the weight room. Right now I am about 4 months out from my next meet (beginner level). While my main goal is to get stronger, a very close secondary goal is to continue my healthier ways (conditioning, heart rate/bpm, low body fat) and improve on them even if it means sacrificing a bit in the weight room. For me, gone are the days of getting stronger at all costs.**

A: First off let me congratulate you on the lowering of your BP to 106/66 and the fact your energy levels and sleep are another great byproduct of proper development of the cardiac system. Amazing what a scientific approach to training does and again my hat is off to you for actually doing the work. Also great work with the prowler and adopting the proper rules for correct adaptations, getting sick from something is never fun or productive.

Now what I would do with the weight lifting is on Monday have it be your developmental day (so hardest day of the week) and then come back 3-4 days later and have a stimulative day (1/2 volume from Monday). For the other days you can do assistance work 3-5 exercises x 8-12 reps (submaximal NO FAILURE). For new conditioning the day after your Monday session you could add step ups or walking lunges 5-20 min per set, 20-30 steps or lunges per minute, keep HR between 130-155 bpm; use resistance if needed. Keep rest periods between 2-10 minutes. First week start with a total of 20 minutes of work and then throughout the 3-4 week cycle bump it no more then 10-15% per week. Just do not go above your anaerobic threshold.

**Q: I am beginning an aerobic block of training and was hoping to get some feedback from you.

I was planning on doing 6-7 days of steady state keeping my heart rate between 120-140, while also lifting 3 times per week. Day 1 and 3 lifts would be oxidative squats/bench/lat pulldown/RDL's and the lift day (Wednesday) would be a circuit of 10-12 exercises keeping my heart rate in the 120-150 range.

Does this seem like too much? How would you add in sled work or aerobic step-ups or is it too early for that?

My current resting heart rate upon waking is between 55 and 58. I weigh 270 pounds and my blood pressure last taken was 120/80. My goals are to get my resting HR under 50.**

A: Based on your goal for resting heart rate I would do 2-3 sessions of cardiac work with HR between 120-140 and then the rest of your days between 100-120 bpm.

As far as the weight work I have no idea if it will be too much for you or not. Just make sure the first session of the week is highest volume session and then the 2nd session cut volume in half.

With regards to step ups or sleds I would first start with step ups or lunges and I would do this the day after your first weight session. Begin with 2 sets x 5-10 minutes with a 2-10 minute active rest in between then progress each week depending on how you feel. Do not exceed your AT because you do not want to use hormones as an energy source prior to your 2nd weight session.

Keep me updated on how you are feeling throughout. I would run this on a 4 week cycle 3 on 1 unload.

**Q: Hey Mark do you see any problems with doing oxidative lifts and running (aerobic capacity) on the same day? What about alactic muscular endurance and running (aerobic capacity) on the same day?**

A: I would not advise doing both on the same day because one is used to develop oxidative capacity through local hypoxia (oxidative squats) and the aerobic capacity work is used to restore and promote hyperplasia of the mitochondria destroyed during the oxidative squats. So do the aerobic capacity work the day after and make sure you stay below your AT, keep the correct rest periods, and the number of reps.

Just don't do exercises/training for the hell of it, understand why and when to apply them.

**Q: I am looking for some alternative ways to get conditioning work done so I added in 2x5min sets of step ups after my squat training. How many times a week should the step ups or lunges be done? I have access to a spin class bike that I plan to use on my off days for 20-30 min (2x's a week). Also where else besides the Q&A can I research these types of methods?**

A: So are you doing the step ups immediately after your squat workout or the day after? Ideally you want to do these workouts (step ups and lunges) the day after, volume of 60-90 minutes (including rest periods). Work periods should be 5-20 minutes with rest periods of 2-10 minutes (active). Do not exceed your AT (you do not want to use hormones as an energy source during this work) and keep the tempo between 20-30 rpm (make sure there is a relaxation phase). You could do these 1-2 days per week.

**Q: For the weight work in a brief microcycle like you suggest, should I go medium (60-80%1RM) or heavy (80-90%1RM)? I know how to get strong, and the weights in this range make me strong, but I know you have talked about heavy weights interfering with vagal tone, etc. Getting strong is one thing, but putting everything together in a holistic program is something else.

My knee pain started during a block of alactic capacity. I worked up from 1x(10x12) jump squats with dumbbells 60" rest per set up to 4x(10x12) 30"rest per set/10 min rest per series over about 5-6 weeks. By the end of the block my HR avg was almost in the cardiac zone during all series.

I am now doing alactic power but the knee pain is making me cautious.**

A: Well, how the weights influence your autonomic nervous system is really going to be dependent on several factors, your current condition, cardiac development, rest periods during weights, reps, and sets. Off the top of my head that is all I can think of.

So now you have to figure out what your focus is during this brief cycle, is it max strength, general prep, explosive strength, development of the myofibers of glycolytic tissue and so on. There must be a purpose. Once you determine your course of training, then select appropriate sets/reps and rest periods based on what you are looking to develop.

As far as determining if this is having a positive or negative effect on your autonomic nervous system (parasympathetic/sympathetic) in the book "Children & Sports Training" by Jozef Drabik, Ph.D, in Appendix A lists a simple method using heart rate to determine optimal loads and recovery.

Excellent work with the alactic capacity work. Keep me posted and if you have any further questions please feel free to let me know.

**Q: How often do you test your athletes? I'm starting to understand what to test for. But I'm not sure how often I should test them.**

A: The testing will depend on a number of factors, sport they play, age, physical or physiological testing, will the testing be used for marketing purposes or training.

For instance there is the synthesis test that I use for soccer players to determine sport specific conditioning that I only do 1-3 times per year because it is very physically demanding. We may test vertical jump with athletes 1-2x per week depending on what type of training they are doing. We may do the 10 second, alactic jump test 1-2x per month.

I think it is important for you to understand what type of testing will benefit you in determining the strengths and weaknesses in your athletes and how this information can be used to better develop the program.

**Q: What is your take on volume for alactic work? Should there be a high volume a couple times a week or lower volume more frequently.**

A: What type of Alactic work capacity or power? For capacity I have had athletes perform as little as 40-80 contacts per week (1-2 sessions using jump squats) and as high as 800 contacts per week (2 sessions) with rest between sets of 10-90 seconds. For Power work it could be as little as 18 contacts per week and as high as 72. Rest between sets should be 2-5 minutes. For exercises we have used jump squats with either kettlebell or barbell, bench press, squat, special hurdle drills with sprints 7-10 seconds.

**Q: My question concerns the use of jump squats as a means of alactic capacity training.

How do you determine if a KB or barbell will be used for resistance? Also when using a KB how do you determine how much resistance to use?**

A: It will depend on the athlete’s training history with us on how we determine the means (kettlebell, barbell, weight vest, or DB) for jump squats. Most of our female athletes use either their body weight, weight vest, DB, or KB. We have some male athletes who use barbell with maximum weight of 40% of 1RM, and the rest will use KB or weight vest.

We determine how they look when performing the jumps with proper form. We always start them with body weight squat jumps early in their training process, then move them to weight vest, then KB, and then barbell. So the progression teaches them how to perform them properly. With KB or any other means we use is based on performing 8-10 jumps in 7-10 seconds so if they cannot complete them within that amount of time then we lower the weight or if they are getting too many raise the weight. Also remember that for alactic capacity work rest periods between 30-90 seconds are used between sets.

**Q: I've been trying to find information on the restoration of mitochondria that is needed for an anaerobic/alactic athlete following an intense game or poorly programmed "conditioning." Searching databases (MEDLINE, SPORTdiscus, etc) did not give me much information. Supertraining and the Q&A search on this site did give me an idea...

Have the athlete perform low-medium intensity (60-70% HRmax, or 120-140 bpm for a college athlete) jogging and incorporate calisthenics that use specific muscles used in the sport. Calisthenics should take up around 10% of total exercise time. Should these calisthenics be things like jumps as opposed to moderate tempo lunges, or incorporate both? An example of this session: 55sec jog @130bpm, 5sec jumps touching bottom of backboard, 55sec jog @130bpm, 5 sec lunges, and so on.

Let me know if I am on the right track. Also, I am unsure of the exact duration of this recovery session should be. Perhaps 2x10 min with 2-5 min rest between?**

A: I don't think you will find anything on the internet or in any publications. I have only heard one person speak of this process and that was Val Nasedkin at the seminar we had back in 2007.

To develop the mitochondria of slow twitch muscle fibers you would perform oxidative work for either upper/lower body using 40-70% of max and using the tempo method (2sec down - 2sec up, no relaxation).

Moderate intensity activities would be heavy resistant bike rides, lunges, or step ups, you would never exceed your AT (remember it will be lower for the bike rides) duration should be 5-20 minutes with a 2-10 minute rest between sets maximum time volume (including rest) is 60-90 minutes. Hyperplasia can only be achieved when working to maximum capacity. All muscle fibers are involved.

Maximum intensity (rarely activated) All muscle fibers are utilized (sled sprints, uphill sprints) length of effort no more than 5 seconds, you must not exceed your AT, rest between reps of 30-60 seconds, volume 20-50 reps. When performing this exercise keep your HR between your aerobic development zone.

**Q: I'm guessing you've never had someone ask you this, but I was wondering if you had any general information or tips on how you would structure a program for someone training for pro wrestling? I'm looking to start attending a wrestling school in the next couple of months and I wanted to make sure I was in the best possible shape I could be. I really enjoy reading your responses on here and I was just curious what advice you would have for structuring a program geared towards pro wrestling.**

A: First, get a really cool nickname or maybe you will become so good that people will just refer to you with only your first name.

What I would do is develop your cardiac system very well with jogging, elliptical, bike, and so on 3-6x per week of 20-60 minutes per day with HR of 120-140. Use different jumping exercise to develop coordination, explosive power. Develop a good general strength base with squats, dead lifts, and bench press. Work on developing oxidative capacity of slow twitch fiber and if you need to add BW doing glycolytic weight work it will put some good weight on. Do aerobic capacity work of medium and fast twitch through bike rides, step ups, lunges, and hill or sled sprints. Lots of core work, grip work. You will need to build large capacities of the different energy systems to handle the long practices so your skill set is performed at very high levels.

I hope this helps you and let me know what your nickname is once you get one.

**Q: In a past post regarding energy system training for the sport of rugby you mentioned to ignore training of the anaerobic-lactic system and to let the practice of the sport itself take care of such training. Is your recommendation the same for basketball, which also draws heavily on all 3 energy systems?**

A: If I would have enough time with a Rugby or basketball player and could put them through the proper progression I would work to build the anaerobic-glycolytic. Now if they are in pre-season or doing a lot of playing then I would focus more on cardiac work, aerobic development at the muscular level with heavy resistance bike rides, lunges, step ups, as well as high speed sled or hill runs.

In order to perform the anaerobic-glycolytic work the athletes must have very high fitness levels and have a solid base of strength work, cardiac development, oxidative capacity of slow and fast twitch fibers, and have the attitude to enjoy doing this work.

**Q: 1: What are oxidative squats?

2: What is their purpose?**

A: Oxidative squats are performed using a regular barbell + weight, the key to establishing the proper training effect is using a 2 second lowering phase and a 2 second raising phase but never allow for a relaxation phase (so there is constant tension). You can perform this movement for 30-60 seconds and then a 30-60 second rest.

The purpose of this type of exercise is to develop the oxidative capacity of the slow twitch fiber. By doing this you improve the ability of relaxation (high concentration of mitochondria) and for athletes, the more then can use slow twitch in competition the less cost on the court of field (because they are purely oxidative). By increasing the cross section by 20% this will equal a 20% increase of speed at anaerobic threshold.

**Q: I was wondering what exercises/drills/stretches your dynamic warm-up consists of? Do you do the same one every time, or switch it up based on the type of workout you will be performing that day?**

A: Neck, shoulder rolls, arm circles, some shoulder work, ankles

 50% sprints

 Jumping jacks/seal/criss-cross

 Body weight squats, arm action, hamstrings

 60% sprints

 Gates swings, striders, leg swings, hip rotations, hurdle mobility, inch worm

 70% sprint

 Groiners, lateral lunges, high knees, butt kickers, A-skips

 Finish with 80-90% sprints.

Yes I perform the same warm-up every time. The only time I don't perform the warm-up is on cardiac days or aerobic develop on the bike.

**Q: You recently posted an example of the dynamic warmup you perform prior to training. Do you have your athletes perform the same warmup or does it vary based on their individual needs/sport, specifically football? What are the distances used for the movement skills/sprints?
Also, if possible could you give an example of how you set up a box jump series. What are the determining factors in selecting box height, volume of jumps for a given series, etc?**

A: All of our athletes, adults, and other people who train with us do the exact same warm-up. The distance of the sprints and other skill work is 20 yards x 2.

Setting up a box jump series will depend on age, training age, have they trained with us before, landing technique, strength, and explosive power. For instance I have a female lacrosse player (16 yrs. old) who has returned to train with us after 3 years away from the program and when she left she had a 40" box jump. Now she has not been doing any physical training at all and only practicing/playing her sport, so on week one we did 3 x 10 + 18", week 2 4 x 10 + 18", week 3 5 x 10, and week 4 will be 2 x 10. Then she is gone for another 5 months because winter lacrosse begins.

There are many factors you just need to figure out the what and the why and begin working on developing programs which work for you and your athletes.

**Q: What is the purpose of aerobic capacity work at the muscular level using step-ups and lunges? Does this work have the same physiological effects as the oxidative squats?**

A: The purpose of those activities is to improve the density of the mitochondria (medium intensity and never exceed your anaerobic threshold). These exercises must have a relaxation phase so no local hypoxia occurs. Hyperplasia of the mitochondria can only occur when working at maximum capacity.

The oxidative squats are working on developing hyperplasia of the slow twitch muscle fibers and this occurs with the pinching of the capillaries, which stops the blood flow to the muscle and creates the hypoxia (no relaxation phase which differs from the example in the first paragraph).

**Q: Just read your post about medium intensity oxidative work, w/ lunges, stepups and heavy resistance bike rides.

With the lunges and stepups, is there any specific pace these should be done with? Like the 2-sec rule in slow twitch work?

And with the bike rides, what determines the cadence used? I have seen the video on YouTube on your channel, and see that you keep a constant pace, is this the pace one should use?**

A: For the step ups and lunges you want to be able to perform that at a pace in which you reach the target heart rates for aerobic development (for instance with one of the government operators I am currently working with his HR zone is 163-177 for aerobic development with this work). Also right now we are using a barbell for added resistance. Remember during this work you do not want to produce any hypoxic conditions so there must be a relaxation phase during these exercises and don’t exceed your AT.

For the bike you want to use a PUSH-PAUSE cadence that allows 20-30 rpm. You mush PAUSE at the top in order to have a relaxation phase. The resistance will be fairly high during this work and yes you want to keep a constant pace or otherwise your HR will fall below or above your target HR.

**Q: Regarding my earlier question about the Mountain Biker.

Here is how he arrived at his lactate threshold...10 min warm up, started test at 100 W of power, increased 20 W every minute until unable to hold.

His age is around 48 and weight is about 165, don't know if you need to know that information.

He's in a GPP phase, so I figured he should be working on increasing capacity of his energy systems required for the riding. I'm thinking glycolytic and aerobic. How would he go about doing this?**

A: I would be curious to see what type of GPP phase he is doing for mountain biking. At the beginning of his training I would be doing more road rides to get in volume while keeping the HR between 100-130 bpm. He would also want to do 1-2 aerobic capacity sessions per week either on the road or on his mountain bike (whatever route he chooses on this the work should be up hill so the cadence is low). Yes he will need some work on the glycolytic side but that training needs to come at the appropriate times and right now is not that time. He could do some sprints on his road bike early in the week for an hour or so (sprint for 7-10 seconds with full recovery 4-6 minutes).

Kevin I would have your uncle do this type of work for 4-8 weeks. He could also perform oxidative squats during this time frame as well. There is no need for him to do ANY maximal strength work. I would have him work a lot on his low back strength endurance and upper back. He will also want to begin doing more sport specific technical work the closer his races begin. Once he has his base fitness down and he has developed the oxidative qualities at the muscular level this is when he can begin doing glycolytic sessions but they need to be specific with regards to intervals of work vs. rest, total time frame for workouts and rest period between workouts (X amount of days/hrs). Depending on where he lives XC skiing is another great avenue to develop the cardiac system.

**Q: I would like to know what tests do you use to test your athletes and how often do you run these tests to see if there is progress.**

A: First off, what sport the athlete is playing will determine what type of tests to apply and how often and also understand that some tests may show a decrease due to certain training effects.

For our football players we test the following:
10,20,30,40yd sprint (electric timed)
\*Standing long jump
Standing two legged triple jump
Alternate one legged 3/5/8 fold jumps
Box jump (no steps)
\*Vertical jump
Weight
body fat
Squat
bench press
Body weight circuit x 4
Hovers for time both front/side
Reverse hyper with body weight

We test either standing long jump or VJ prior to all training sessions to determine readiness for training. Some of these tests we perform once a week, some once a month, it all depends on the athlete.

One other point is to find empirical data on testing for different sports at the elite level.

**Q: In your last response you mentioned testing both VJ and LJ before a training session to assess readiness. Could you elaborate on this. Pre or post warm-up? Standards? Etc.**

A: I either pick one or the other and have the athlete perform 3-5 single reps with 30-60 sec rest prior to the workout after the warm up. If they fall 6% below their previous best effort then I adjust training volume and intensity.

The adjustment of the workout is not a fixed percent. You know your athletes better than anyone so this is where the art form comes into play.

The reason we do this is to gauge neuromuscular readiness for the given workout.

**Q: I am a freshman in high school and I play football (didn’t start) at North Thurston High and I am 5'9" and my arm span is 6'4". I want to play corner and I have a 40 meter time of 5.001. How will I increase my speed?**

A: Here are some suggestions, begin by beginning your sessions with active warm up followed by dynamic work. Also in your dynamic warm up you may want to add core work, i.e. hovers, reverse hypers, etc and also work on foot and ankle strength. 1-2 times per week perform 0-30m sprints from various start positions on the ground with 1-3 min recovery between reps, keep volume between 180-300m. Also perform jumping exercises (box jumps, skips, hops etc), along with some explosive medicine ball throws.

Perform 1-3 days of low intensity medicine ball work try and perform 400-800 throws per session with a 6 to 8 lb ball.

To build general strength begin with a body weight circuit consisting of 10-15 exercises either perform reps i.e. 10-20 or do each exercise for time 20sec on 20sec rest. Do this circuit 3 times per week. Build up to 5 times through the series.

Begin lifting barbell weights but only to perfect your form use 50-80% of body weight and perform 1-2 sessions per week.

Don't be concerned with how much weight you can or cannot lift because if you get injured, it becomes very difficult to get faster!

Be smart with your training and think LONG TERM!

**Q: I have read some of the recent posts concerning the training of athletes 13-14 years old, but I was wondering how the training may differ when athletes this age are playing multiple sports. For example, an athlete that plays or going to play both high school football and basketball (as many do). I know plenty of body weight exercises and such for strength training that they can do and ways of planning them but are there any general guidelines for the programming of short sprints, tempos/conditioning, jumps, etc. for athletes this age and of multiple sports. I'm assuming one thing would be a less volume of jumps due to the basketball season.**

A: At this age and with kids playing multiple sports here is what I would recommend:

Check the readiness of the athletes prior to each session to see what they are capable of doing and adjust volume accordingly.

Have them perform a long warm up which includes active, dynamic, hurdle mobility, core work etc. This should take 15-30 minutes.

Keep sprint volume to 100-300m per session and make sure they have full recovery. Distance between 0-30m.

Jump volume prior to football season is dependent on the preparedness of the athlete. So for me to prescribe volumes would be inappropriate. Keep them very basic i.e. jump rope, skips, hops, low level reactive work etc. Also jump training can be used as strength work as well. You are correct for in-season basketball do not perform any jump training let the games and practices take care of this.

Use med balls whenever possible for strength, GPP, core work etc. Body weight circuits for strength can range from 10-15 different exercises in one session. Introduce barbell weights at very, very low weights. You do not want to produce any hormonal release with 13-16yr olds.

Also tempo work is not the only way to condition for sports.

Remember this: It is always easier to correct a program in which an athlete is undertrained as opposed to overtrained.

**Q: I know you guys have a lot of experience working with young athletes, so I wanted to just run something by you guys, any input would be appreciated. I run strength and conditioning sessions during the summer for volleyball players. All athletes are females, ages 14-18 with various levels of preparedness. Sessions are performed three times a week.

My basic template is:

1.) Warmup (20 mins)- Basically Parisi Method

2.) Speed/Power (15-30 mins)- A circuit consisting of 3-5 of:
A. Unilateral jumps - bounds, etc.
B. Bilateral jump - broad jump, etc.
C. Linear speed - short sprints
D. COD - pro shuttle, various "cone drills", etc.
E. Total body - med ball throws, etc.
\*\*two-minute stations, about 10-20 seconds of work followed by the remaining time resting\*\*

3.) Strength- a 5-exercise circuit consisting of:
A. Push - sled variation or pushups
B. Pull - with the sled or pullups
C. Lower, leg - backwards drags or a lunge variation
D. Lower, hip - other sled drags or trap-bar deads
E. Core - a front or side bridge variation
\*\*two-minute stations, 30 seconds of work followed by ~90 seconds of rest\*\*

4.) Warmup - Working backwards from easy dynamic stuff to some light static stretching. Also additional stuff like the I/Y/T/A's from Zach's DVD.

Main focus is to increase general strength while also developing explosive power. I figured this circuit layout will allow me to challenge a variety of preparedness levels: I will select lower loads for the less prepared ones so their sets will be higher in repetition and greater loads when appropriate, all while allowing me to give 6-7 athletes at a time continuous work. I'm trying to keep all work periods shorter than 30 seconds to stay out of the lactic zone.**

A: I am a little confused on how you have the Power/speed circuit set up is it 3-5 reps of each exercise? And 10-20 seconds of work followed by rest? Give me more detailed information on that.

On the strength exercises why are you selecting the exercises you listed? I don't know how your facility is set up so maybe this is the only way to do it. Focus on exercises like lunge medicine ball throw to partner, squat throws with partner, lateral lunge side medicine ball throws, if you don't have a reverse hyper have the girls get up on a high box and replicate it or a hyper complex. Have your athletes lie on the ground face down with arms on ground over head with a light 2-4lb med ball, have them arch real hard and throw ball backwards to partner. Start working them on the squat with a broom stick or light weights. Do kettle bell jump squats or KB squats. Instead of sled pulls, get a rope and do tug of war (competition = FUN). You could even go 20 seconds on / 20 off so the density of work is increased. The other thing you can do is a 60-75 minute session which includes short sprints 0-15yd, jumps, and medicine ball work for the remainder and for variety sometimes take out medicine ball work and put in a body weight circuit consisting of 15-20 exercises.

When doing any jumping exercise make sure you teach them how to land from a low box 8-15" dropping down, and jumping up as well. Most girls knees will tend to come in so you want to correct that.

One other thing go to www.plyotruth.com this is Nils Holmdahl site and he trains volleyball players in Sweden and this site is dedicated to volleyball only. Some articles are in English and there are videos and pictures as well. Nils is very good friends with Yuri Verkhoshansky. I just got a set of his weight releasers today from a good friend of mine.

**Q: In reference to sled dragging, I was just using it for speed work and posterior work. Him being so young, I guess I could wait a few years. What do you think?**

A: Scott for posterior work using lunges, walking lunges, reverse hypers + body weight only, running, jumping, step ups, body weight good mornings the list is endless. Exhaust all avenues in which Mother Nature blessed your son with and then and only then should you begin to stimulate his hormonal systems. Another great way to develop all of these qualities is to have him swim and do gymnastics.

Also setting time lines to begin using a specific exercise or change training methods just because he turns a certain age is dangerous. He will let you know when he is ready. One of many things I learned from Charlie Francis is continue to set your athletes up for success every step of the way. If he's not ready failure and disappointment will rule the day which you don't want.

**Q: I saw where you posted a sample workout from one of your players on your website and noticed that he benched, squatted, pushups, and split squat three times per week. What changes for this type of athlete after that phase. I believe it was four weeks. Does he continue to do those exercises three times per week. Can he develop overuse using these exercises so much?**

A: The example I put up there was for a sixteen year old athlete who I have trained for three years. This kid's skills, athletic ability, coordination, work capacity are off the charts. For example he holds our depletion push up record at 661 and did when he was a freshman in high school. He has a two legged triple jump of 26' and can perform a 180 degree turn in mid-air while jumping onto a 24" box and then does a back flip to a back hand spring (My good friend Chris Carter taught him this move in three months). So to answer your question we just kept right on with the same exact program and have had no problems. I do not change the exercises very often with our athletes (At last count we have only about 20-25 total exercises).

**Q: A triathlete asked me to put together a general strength program for her. I am no expert, but I know a little bit, and I had a difficult time with this request for 2 main reasons:

1. I've never worked with endurance athletes
2. The athlete is "in season" but wants to put a greater emphasis on strength training because she has battled several minor and believes they are due to a lack of overall strength.

Rather than put together an annual plan, I offered this routine and told her to do each session twice before we make any changes. She plans to lift 2-3 days per week:

Day 1 – Barbell – 4x5 (4 sets of 5)
A. Quad-dominant Bilateral – Squat
B. Horizontal Push – Bench Press
C. Horizontal Pull - Row
D. Ab Work

Day 2 – Dumbbell (DB) – 2x15
A1. Quad-Dominant Unilateral - DB Lunge\*
A2. Horizontal Push – DB Incline Bench Press
B. Hip-dominant Unilateral – DB 1-leg RDL
C. Horizontal pull – DB Row
D. Ab Work

Day 3 – Barbell – 3x8
A. Hip-dominant Bilateral - Deadlift
B. Vertical Push – Military Press
C. Vertical Pull – Pull up
D. Ab Work

The athlete is a 24-year-old former collegiate swimmer with 4 years of lifting experience (while in college). She began training for triathlons one year ago.**

A: So the athlete has battled "minor” (injuries?), now why is strength training going to solve this? Maybe she is overtrained? Maybe her saddle height on her bike is too low/high? Is she running in old shoes? What are the "minor” injuries? What is her weekly training volume in all three events and how much racing is she doing. Maybe the program you gave her will make her injuries worse. Triathlons are very tricky because in competition you only support your own body weight in one part which is running. Saddle height is extremely important for cycling and there is a great formula for figuring it out.

You have to always ask yourself is giving the athlete more work going to improve them? Sometimes what you take away may solve the injury issue i.e. reduction in volume in running/swimming/biking may help, finding out at what intensities she is training in (If she doesn't already, make sure she gets a HR monitor). Find out when the injuries happened and what might have triggered them.

Some short background on why I answered this question, in my past life I completed twelve triathlons, have done two marathons and competed at a high level of cycling (My son is named after the great Spanish cyclist Miguel Indurain).

**Q: The soccer coach at my school is interested in updating his battery of tests (of which I can say is a relief because he is very outdated - 1 mile timed run anyone?). I have some ideas but was wondering if there is anything else anybody finds purposeful for soccer.

30 meter sprint
60 meter sprint
20 yard pro-agility shuttle
Vertical Jump
Standing Broad Jump

\*\*Is there any type of good conditioning/metabolic testing that would be appropriate- I need to break him of this mile run thing.

I am not looking to test in lifts yet because most of them don't lift, and the ones that do, don't do anything productive.**

A: Here are some ideas:

1) Repeat 20m sprints 7-11 reps + 2 minute break between each one.

1A) 20m sprints 3-5 reps

2) 3 fold or 5 fold jumps on one leg (L-R-L etc).

3) Explosive medicine ball throws for distance.

4) Metabolic testing must be specific to position, distance traveled per game at different intensities, first half vs. second half etc.

I recommend also doing a google search on Ricardo Proietti Phd, who works with AC Milan youth soccer and is the author of "Strength and speed training in soccer" and "Power aerobic training in soccer."

Soccer is an aerobic/alactic-power sport so train accordingly. Strength itself is less important in the weight room, it's how and when you use certain exercises to build specific biological systems which will allow the player to perform at their highest level for long periods of time.

**Q: In the latest article by Jim Winkler he refers to foot and toe exercises. Anyone know what they are?**

A: Here are a list of the foot and toe exercises Jim spoke about in his article. We include some form of these in our training every day.

Example exercises: Feet;
-bare feet on PVC tubing
-stand and pull feet/body with toes
-move weight on floor forward/backward and side to side with foot
-heel/toe raises

**Q: How are depletion pushups performed?**

A: Have your athletes all line up in a row (say you have 10). The first guy does one push up, then the second person does one, then the third and so on. Then when it comes back to the first guy he does two pushups, then it goes to the second guy and so on (you get the picture). Then once a person cannot perform the set number of pushups they are out, until it is down to the "last person standing."

**Q: Our athletes are lifting 3x/wk right now and I want to add some sled/wt. tire dragging to the mix to get the conditioning up. Would it be a good idea to do it after the lifting? I know working on off days would be better, but getting them out to our school more than the 3 days/wk is not very practical in our situation (rural school = driving distances + camps, baseball, etc)**

A: One suggestion, say you are doing your sprinting, jumping and lifting on #1 and #3 during the rest periods make sure the athletes are staying active i.e. jogging, core work, cardio equipment with HR 120-130 etc so they begin to build the cardiac system on limited time. They can do cardiac work every day on their own if they want with the HR between 120-130 for twenty minutes. On day #2 then you can do more sport specific conditioning.

My problem with just walking or dragging a sled is the HR never gets up high enough for sport specific aerobic development, and I have yet to see football players walk with something tied to their back in a game. For now if you can get one quality day of conditioning, once the pre-season starts you should be fine.

Better to start them off a little under-trained.

**Q: I will be working with two young male athletes (ages 10 and 12) who are involved in multiple sports during the school year. Upon my first meeting with them, they are both very cognitive of what goes on with their bodies, what areas of performance they seem to lack and their overall communication skills are very good. They are very self-motivated and excited about training. They are active during the summer with camps, club teams, and normal active young kid stuff. I wanted to get your opinion on some good ways to begin their training. We will be meeting at a local high school track with a football field, so no weight room or gym, etc. Would it be wise to directly test them in a battery of movement skills? Such as: MB Throw for distance, Sprint time, broad jumps, calisthenics, etc. I do plan on teaching deceleration/proper landings, lots of MB stuff, calisthenics, sprints etc in proper workout sequence.**

A: Based on how busy they are in the summer or in the school year with other activities you will have to gauge your training on how they feel when you are with them.

At this age make it very fun for them so structure the training in game settings where speed, coordination, strength, and endurance are all rolled into one. Make the warm ups fun, the core of the training fun and the cool down fun. Keep the sessions between 30-45 minutes 2-3 times per week If you are going to be at the field the training sessions are limitless as to what you can do. All the activities you list are great i.e. med ball work, sprints etc. Keep the sprints to no longer then 20m with full recovery (2 minutes or more and volume about 80-140). I would test 10/15/20yd sprints, long jump, 2 legged triple jump, softball throw, maybe pushups or pull ups. Get a broom stick and at certain times begin to teach them proper squat and bench press form.

Also go to the website www.athleticscoaching.ca and click on sports science articles and go the link labeled Youth training. There are excellent articles there which will help educate you further, the one I highly recommend you reading is by Dr. Ekkart Arbeit.

One last note, you obviously have a good sense as to what these athletes should and should not be doing so now begin to apply your knowledge, keep as detailed notes as possible, watch how the two athletes interact, how they walk, carry themselves so you can begin to teach yourself the subtle ways of knowing if the athlete is truly ready for the days training. Ask millions of questions and get a sense of their personalities. Your must build many skills as a coach. I really look at my job as being a history student, learning from past accomplishments and failures from the great coaches and trying to adapt and implement the ideas in a positive way with the athletes I train.

**Q: I noticed in one of your sample templates for a 16 year old athlete that he is squatting, benching, split squat, jumping, and performing pushups three days per week. Once this athlete advances, how might his split look? Will he still do all these drills three days per week? Also, do you always use the reverse hyper and glute ham raise for body prep, or do you use other movements?**

A: Once the athlete stopped making progress, and I had exhausted all avenues, his program would change slightly. Since we now have an indoor running surface, on M/F we may perform some short sprints (0-30yds), or jumps prior to his weightlifting sessions depending on what we view as his weaknesses. His main lower body exercise would either be squat or split squats and the intensity would be dictated on the type of adaptation we are looking for in either fast twitch or slow twitch muscle fibers. After he has completed the main lift we then move to a 10-15 minute circuit consisting of ankle work, coresage, upper/lower back and shoulders. This is where we have moved the GHR and RH that you mentioned. In our old 800sq ft space, exercise selection was limited so we had to make the most of our time. Tues/Sat we would have him do sport specific conditioning, we base intensities on the athletes anaerobic threshold, volume in the sport and position and we use a HR monitor to insure we are working in the correct HR range, after he completes this, he would perform 15 minutes of a pre-selected circuit, plus bench press. Wednesday is purely an alactic day so special jump exercises, sprints etc and Thursdays we would perform 20-30 minutes of cardiac work with HR between 120-130.

**Q: When training athletes ages 11-12, do you use basic calisthenics and plyos, or do you have them do a multitude of movement drills and games to help prepare them for sports such as football.**

A: When we work with young athlete we perform short sprints 0-20yds, relay races, plyos will include box jumps, reactive jumps (low depth jumps to hurdle hops, low depth jumps to sprints or standing long jumps, etc) we do high jumps of many different varieties, skipping, we also perform gymnastics during this time. Coordination work is also a priority and can be solved with many types of training. Strength work is either medicine balls, body weight, pulling or pushing against partners body weight or resistance, tug of war etc. Now you can perform this type of training in a game situation or a semi-structured format. I prefer games for groups because it keeps it fun, now if you only have 1-2 athletes then structured maybe the only way.

Ideally you would want your athletes to stay in this phase for 2-3 years.

**Q: I noticed you like to use the concurrent/complex method of training. When introducing an athlete to barbell bench and barbell squat, would you have him do it three times per week? How might you progress these exercises?**

A: Yes, I prefer with our younger/less advanced athletes to use the complex method of training or if we have a shorter preparation time we even use it with our advanced athletes.

For the younger athlete in bench we will perform the lift 1-2 times per week, and use a weight which represents 50-80% of body weight. Once they master the technique we then have them work with their 10RM with 2-4 sets per session. As they become more proficient we raise the weight. Once this method has been exhausted we will then move to 5RM, and then to 3RM.

Squat is completely different and we have changed our progression. After some conversations with Coach "B" aka the "Jack Hammer" we only teach the squat with broom stick at the beginning and all strength work for the legs is performed with jumps, sprints, lunges, one legged squats etc. Once we have prepared the athletes, we will then begin to use resistance to improve the energy potential i.e. use squats to increase the size of endocrine glands etc.

**Q: What do you think are some of the best methods to build an aerobic base besides running or tempo run work?**

A: If we are speaking about developing the aerobic system for team sports, first focus on developing the cardiac system with heart rates between 120-130 for durations of 20-30 minutes and this can be done every day. Lower intensities 100-120 helps to stretch the muscle fibers of the left ventricle and increase stroke volume which is done for endurance sports. For the development of aerobic system both power/capacity you have to figure out what the sport requires, next determine what your anaerobic threshold is. Once you answer these questions then you can design a specific aerobic development program. Just remember not to exceed your anaerobic threshold during the sessions as it leads to hypoxia and destruction of the mitochondria.

**Q: I would like to learn more about what you think in regards to building a cardiovascular base for athletes in sports such as powerlifting and football.
I have read that you like to perform 20-30 minutes of cardiac work with HR between 120-130. Do you like to accomplish this with bodyweight movement circuits or with light med ball throwing work wearing a heart rate monitor? Do you think this would be best for athletes like powerlifters and football players who wouldn't necessarily like continuous running?**

A: The adaptation requirements are so much different between a powerlifter and a football player you cannot compare the two. Football players need a dominant parasympathetic nervous system and powerlifters do not require this type of adaptation. This is why just developing strength is insufficient because over the course of a game you cannot sustain strength and power because the other biological systems were not stressed. The adaptation you are trying to achieve must match up with the sport. For the development of the cardiac system we use either walking, elliptical, bike, low level medicine ball throws, weight lifting, body weight circuit, etc. Again this is just for football players. I would look at what some of the powerlifters on this site do to develop their cardiac systems.

With the specific aerobic work we do with our football players we have documented increases in relative Vo2 max, aerobic index, adaptation index, anaerobic threshold (all of these measured on the Omegawave). As well as aerobic power and capacity in the training sessions we monitor.

**Q: I noticed you use the concurrent approach often. Does this method change with your high level athletes? Do you have your high level athletes sprinting and jumping all off season?**

A: With our more advanced athletes our system is dictated on what is limiting them, and the training is determined on a daily basis as to the readiness of the body's systems and how they adapted from previous day training. Just because your coach says lift heavy squats, or do aerobic work today does not mean you are ready. The system of training we implement, is first determined by sport specific adaptation required and what the biological systems (cardiac, metabolic and n/m with the Omegawave) show as the limiting factors of the athlete for his/her specific sport. From this point you build the weekly training cycle based on these evaluations.

I collect a lot of data with our top high school, college and professional athletes during specific training sessions i.e. heart rate during exercise, heart rate during active rest, duration of sets, heart rate during all sets and series compared to last training session of similar loading etc. If we are looking to develop either the anaerobic, aerobic, or cardiac systems we know exactly where heart rates need to be to achieve the training effect. We also chart progress of aerobic capacity in both volume of reps and time spent during specific sessions. The more information I have the better.

Preparing team sport athletes is more than just building brute strength or performing tempo runs. You better figure out a way for them to display their skill, at their highest level for the longest period of time i.e. increase the biological power of the athlete.

To answer your second question it all depends on the athlete.

**Q: Can you clarify something you said recently please.

"The other question would be, when athletes perform strongman training at their current facilities do they even know what their anaerobic threshold is? If so, does the coach understand how to structure the training to induce proper adaptation? Because if you exceed it, when training athletes for team sports, you enter into areas you don't want to be in. You also need to understand how to improve velocity at anaerobic threshold."

To clarify, are you saying that an athlete shouldn't train about anaerobic threshold? If not, why not? Also, if you do not go past anaerobic threshold how do you increase it?

If you can point me in the direction of some reading on this subject that'd be great. I have most of the 'usual' texts, so if there's anything in Supertraining, for example, that directly answers this feel free to just tell me to read it!**

A: 1)Q - "Athletes Shouldn't train above anaerobic threshold"

1)A - No I am not saying that because for instance if you are working on developing fast-twitch/glycolitic fibers, exceeding your anaerobic threshold when lifting barbell weights is very easy and this leads to a large discharge of hormones. So say this workout was performed on a Monday and your conditioning session is now on Tuesday you want to avoid hypoxia in the anaerobic zone which leads to more destruction of mitochondria.

2)Q - "If you do not go past anaerobic threshold how do you increase it?"

2)A - To increase anaerobic threshold you want to work at it or just slightly above 2-3 bpm. Now you have to decide if you need to increase aerobic power or aerobic capacity and this will be dependent on the sport you play or train athletes for which will dictate length of exercise, rest periods, loading etc.

The books I would recommend you read are "Adaptation in Sports Training" by Atko Viru and "Biochemical Monitoring of Sport Training" by Atko Viru and Mehis Viru.

**Q: I am looking for a program sport specific to field hockey, lacrosse would be fine as well. I was a college football player and have been doing some recreational MMA training. I have a enough knowledge to design a decent program but would like some advice. I would like to know if there is any structure or exercise differences to incorporate do to the different nature in the sport from the one's I am familiar with.**

A: The first thing to look at is the requirements of the position you play, this will intern be how you build you sport specific program. The second variable is to determine areas you need work on (limiting factors) i.e. cardiac, neuromuscular, metabolic systems, this will help determine how to set up your program. Now based off of your limiting factors and the requirements of sport/position now determine what your short term goals should be i.e. training cycle. Also once you have physical and physiological data on yourself compare to elite athletes in your sport.

The exercise itself is not that important it’s when and how you use it that becomes the biggest factor. The exercises must be in place to properly affect your limiting factors (which you determine before beginning your training) which will in turn increase your biological power. Strength and speed alone will not improve your performance, but you must have the energy to repeat your skill at the highest level for the longest period of time, in either practice or game/match situations.

I suggest, if you don't already to read "Special Strength Training" A practical manual for coaches by Yuri Verkhoshansky. Adaptation in Sports Training by Atko Viru and Biochemical Monitoring of sport training by Atko Viru and Mehis Viru. Visit Dr. Verkhoshansky website www.verkhoshansky.com.

For team sports the skill of the athlete is very difficult to improve on so you must figure out how they can display it more frequently.

**Q: I am a high school football coach and was wondering if you use the prowler in any of your conditioning for your football players? If you do, are they separate sessions and how long are the sessions?**

A: At this time we do not use the prowler.

What do you mean by conditioning?

From the small amount of video I have watched of athletes pushing the prowler, I have a hard time figuring why they are doing what they do. For American football if your developing aerobic power, the sprints must be sport specific in duration and intensity, you must not exceed anaerobic threshold, and your rest periods must be appropriate along with the correct number of reps.

You must also have some method of determining anaerobic threshold and then setting standards in training to accomplish your "conditioning" goals otherwise you are wasting the time and energy of your athletes.

**Q: I was going through you combine training format that you outlined. I see for the Jon Apgar project you utilized tempo runs and he seemed to recover well. I also took note of your sprint volume used with him. You have been in this game quite a bit longer than I have. Have you noticed that athletes have difficulty recovering from tempo runs? Is this why you put such an emphasis on the omega wave? Also, I recognize you were big into ME and then utilized jump squats. Do you feel jump squats are more sports specific then dynamic squats? I am curious as to your response and I do appreciate whatever opinion or knowledge you choose to lend.**

A: Since I wrote that article we have discontinued using tempo runs at all for any of our team sport athletes. After looking at the HR achieved during those runs, duration, volume, we were not developing either aerobic power or capacity and they were non-specific to the sport of football so we eliminated them altogether. Recovery was not the issue, figuring out how to best develop proper energy output and using the time of the athlete more wisely.

The reason I put such a high price on the Omegawave is that it monitors how our athletes are adapting, what systems need work and which ones need rest/recovery. Example I had a kid who spent 8 weeks at an NFL combine facility getting him ready for Indy, now he performed well at the combine but was well below PR's established at our facility. When he came back to me, he had only 4 weeks to prepare for his college pro day, now with the stress of travel, stress of the combine, the fact he had to fly back to have all 32 teams re-examine his shoulder, bad sleeping arrangements, worried about how teams will perceive his shoulder issue etc. The OMW showed us that he needed rest. Now we kept on training just at very low intensities, different recovery exercises, and so on. I mean you would be shocked at how much we DIDN'T DO. At his pro day he shattered all of his PR's, there were 15 scouts who went away very impressed, and the kid was drafted in the fifth round from a DII school.

The program I designed for Jon was based on his strengths and weakness and was greatly influenced by Yuri Verkhoshansky. My reasoning behind using jump squats was the development of Alactic Capacity.

**Q: That is great info with the omega wave and how you train your athletes. The more I read and learn the more I wish I could go back and do things to an exact science.

My question is do you use any sauna or water recovery methods with your athletes if so what do you do.

Do you also use any EMS with your athletes for recovery.**

A: We only recommend medium temp. Saunas with alternating short cold showers if the athlete is parasympathetic over-reaching. If they are sympathetic we keep them away from the sauna.

As far as water therapies go, I base everything on the Omegawave readings, so for instance if they are sympathetic over-reaching we have them use cold shower in the A.M. with brisk toweling, outdoor swimming and for parasympathetic we use contrast showers, Epsom salt baths.

I do not use the EMS.

**Q: How do you set up your weekly training programs out of season for college football players? When do you perform your ME/DE workouts? How many assistance exercises do you do in a workout and what are the sets and reps for those as well?**

A: I do not program out exercises based on ME or DE which I assume refers to the Westside system for powerlifters. I don't believe that the adaptations for powerlifters suit football players. One of the main criteria for this is football needs to exploit vagal tone and powerlifting does not allow this to happen, also to produce the optimal amount of biological power, adaptations need to be achieved in all of the following areas: cardiac output, hyperplasia of endocrine glands, hyperplasia of fast/slow twitch fibers, and proper functioning of the autonomic.

So to answer your question I really look to achieve optimal strength levels with our college athletes and then use these levels to build all of the other systems based on % of 1RM.

Our first 4-12 weeks of training after the season is spent doing general prep exercises, medicine ball throws, cardiac work, dynamic flexibility, jump training (90-300fc per week), barbell lifts with 75-85% of current max using the repeat-serial method (this is from Dr. Verkhoshansky pg. 22,Special strength training, A practical manual for coaches). Once this cycle is complete we then move into more sport specific training, both with the weights and conditioning and this is where you see who is mentally tough. At this time we only use about 10-15 different exercises total.

Our assistance work once into the sport specific phase is done in a circuit like manner and always involves ankle work, core work, shoulders, upper back and is completed in 10-15 minutes.

**Q: I read a study that said that in elite basketball players, average heart rate during the game was about 171, lactic acid build up was 6 mmol at half time and 4 mmol after the game. I believe I read in Viru's biochemical monitoring of sports that at 4 mmol you are reaching anaerobic threshold. So if at halftime, elite basketballers are breaching this threshold and after the game these guys are right at the threshold, shouldn't basketballers train at this threshold for extended periods of time to mimic the game?

As for the heart rate, you mentioned that practices do not approach the intensity of games. I assume that is because there is way too much standing around at practice for instruction, waiting turn for drills, etc? Would you agree with the assessment that if you could cut down time during practice significantly then practices would better prepare players for games, conditioning wise?**

A: The answer to your first question is yes they should because bb players need both aerobic capacity and power. So training at AT levels to build the capacity would mimic 4x8-15 minutes with a 2 min active rest between quarters (1st and 3rd) and a 5-10 min break to represent half time. These workouts will help to develop the oxidative capacity of the slow twitch fibers. So by developing the capacity you can execute your skill at a higher level for longer periods of time. You also must have physical testing which can accurately test for increases of both power/capacity of the aerobic system as well as MAP (Maximum Anaerobic Power). Just saying someone is getting in "better condition" will not work. Show me proof!

For basketball and all sport, practices must be well organized, so if you took the conditioning model which I presented above and moved it into practice that would be ideal. You would just have to figure out during those time frames which skills you wish to work on i.e. shooting, dribbling etc. Doesn't it make sense to practice at intensities (HR 165-175) which are achieved in games?

This model is another reason why having the Omegawave would further enhance the quality of practice and improve upon game readiness. I am currently running in-season Omegawave tests on some high school bb players who we have baseline readings on from the training over the summer and it's amazing to see the drops in the metabolic indexes and how overly tired the cardiac system is becoming because of inappropriate practice levels (too much volume and intensity).

Within the next several years my company Performance Training Center will form its own club soccer and basketball teams which will allow me to have the total control over implementing a systematic approach to how team sport athletes should be cared for from practice, games, conditioning, sport specific programs, restoration, diet and so on.

**Q: Thanks for the advice on the "survivor" workouts. a couple more questions though - one, should I be doing a lighter lower body workout on Wednesday so I don't suffer extra hard on Thursday, and a heavier one on Saturday, or would it make any difference? And also, what would some "light medicine ball" drills be?**

A: One quick question how much time does it take you to complete one of these "sprints" and how many reps do they have you complete?

I have no idea what you mean by "lighter." I am assuming this is your preparation period for football so my question to you would be how long is this type of training going to be going on for? 3-5 weeks? a couple of months? If only for 3-5 weeks then maybe you don't squat except on Saturdays and on Wednesdays perform some type of single leg movement, plus calf raises, barbell jumps squats etc. Then on Saturday switch to squats for week one perform 3x10, wk-2 3x8, wk-3 3x5. At some point also I would begin to include some bounding, box jumps, lateral jumps, low hurdle hops, and so on but wait until after your "survivor" workouts are over with.

Medicine ball work would be basic chest passes, underhand scoop passes, side-side, overhead throws, etc. Just keep the intensity fairly low-key. If you have a HR monitor keep it between 100-130bpm.

One other note you may think about taking ice baths immediately after Mon/Thurs "sprint" sessions. Do not take hot showers on this day because it will lead to more inflammation. On those days, add in evening static stretch for 10-15 minutes, also practice visualization techniques i.e. see the pain or soreness flowing out of your body over and over again. One other method you can try; do not oversleep on weekends compared to weekdays so wake up at the same time. When Monday rolls around and everyone else is training in a "jet lag" state at least you will be fresh as a daisy.

**Q: If you didn't have the Omega could you still do Val's methodics? What would some signs would you like for HR, asking the athlete how they feel?**

A: Yes you could still implement the methods.

The signs of adaptation for each biological system would be different so you would have to come up with protocols which are proven for each system. For the cardiac system as an example use lying HR then stand up and re-take 20 seconds later then note the difference. You will have to build your own empirical data on this. There are other tests for other systems such as autonomic, CNS, metobolic, detox and so on.

**Q: What type of Cardio do you do, when you HS athletes that are 2 sport or three sport athletes. For example a girl who plays soccer and then has basketball. The girl uses different energy systems for each sport. Also, what type of strength training would you work on? Each sport demands different strength in their sport.**

A: I would still perform cardiac work with HR of 120-130 bpm. Yes the girl would use different energy systems (aerobic capacity/power, alactic capacity/power or anaerobic glycolytic capacity/power) but to DEVELOP THE CARDIAC SYSTEM the rules remain the same regardless of the sport.

The strength work for each sport, up to a certain point, would be general in nature. Then after a certain amount of general strength has been attained our system will then deviate to develop adaptations of different biological systems. So as I have stated many times the lift becomes secondary to when and how I apply it based on what we are looking to develop.

Training soccer players requires very specific lifting protocols which I am not going to get into at this time.

**Q: I am helping a JUCO basketball player prepare for his season in the fall. My questions deal specifically with conditioning. 2x a week (for the next 6 weeks) he is performing 4x10mins @150-160bpm with 2 minutes of active rest between sets (walking). This is aimed at increasing aerobic power. On to the questions:

1. Do you feel like the 4x10 mins is appropriate for the conditioning of a basketball player? I broke it down like this in order to mimic a game. I plan on flat loading this as time progresses, ending with 2x20mins before transitioning into fartlek.
2. Without any way of knowing lactate threshold, is 150-160bpm accurate for the situation? He has good aerobic capacity as it is (sub 6min mile).
3. Is flat loading the way to go? 4x10; 3x14; 2x20 @150-160bpm**

A: You are moving in the right direction but for the development of the oxidative capacity of the fast twitch muscle fiber i.e. special interval work the duration to rest must be appropriate along with the activity and you must first work on developing oxidative capacity of the slow twitch muscle fibers of the skeletal muscle.

Now the time frames you have broken down look very good what you may want to do is actually have the player perform specific drills; dribbling drills for the first segment say 1x10-15 minutes then rest 2 minutes then 1x10-15 minutes of shooting drills then rest 10-15 minutes. Then work 1x10-15 with another segment of the game rest 2 minutes then finish up. I would keep HR between 165-175bpm during this time.

**Q: Thanks for the quick response. I decided to do away with increasing oxidative capacity of the slow twitch muscle fibers because he just got done with a 6 week adult league in which the games were not incredibly intense. He was bribed into it, lol. I watched a couple games and decided that the intensity and duration of the games would take care of the oxidative capacity of the slow twitch muscle fibers. I should have included this in my first post.

Thank you for the ideas on the specific drills. Aside from dribbling drills and shooting drills, would it be appropriate at this stage to include things like rebounding (throw ball up, have him jump up for the rebound, run to half court, repeat) or would this be in a later stage due to the jumping aspect of the drill?

When I wrote about "flat loading" I meant keeping the absolute intensity the same (150-160bpm for 40 total minutes of work) but changing the relative intensity (4x10 minutes, working up to 2x20 minutes). Do you feel this would be beneficial?

Also, I was looking around and you are correct about the HR. 175-185 is right on the money, especially for a guard.**

A: Yes you could do the rebounding drills dribble to half court etc. Or you could have him run off screens, shoot, rebound and repeat. Have him run the offense he does in college and mimic his spot on the offensive end if possible. If he practices with other players make the intensity is within the desired HR ranges because by adding extra people intensities may tend to be lower.

As far as duration I now see what you are saying. Now if he plays the entire 20 minutes in his games then work him up to that or you could have an active rest of 2 minutes which counts in the overall 20 minutes if that makes sense.

I have plenty of studies on the time requirements, HR ranges, maximum jumps etc with basketball players so I am glad you took the time and effort to find them yourself.

**Q: The two articles you wrote on football and the RAST test are fantastic!! As a coach and father of two I have seen a whole lot of mistakes in training athletes.

I have a couple questions when is your web site at the PTC going to be up again? When you train two sport athletes that play basketball and soccer. How much aerobics do you do and what type of exercises do you with the two sport athletes?**

A: Our website re-launch is tentatively set for the week of Nov 1 - Nov 8 along with a newsletter.

With regards to your second question the aerobic system (both capacity and power)needs to be developed differently for both sports. The first consideration must be developing cardiac output which can be accomplished with 20-30 minutes per day of work on elliptical, bike etc with HR between 120-130 bpm. This can be done every day and should be the focus early on in the training plan. To develop the aerobic system heart rates must be specific to the individual (for instance with my training my aerobic development zone is 153-167 for running exercises and if I do any bike work I perform at the lower range of this).

You can use all types of exercises to develop these systems, it will just depend on the type of adaptation you are looking for. For instance there are short sided soccer games 5v5 + goalie which can be performed on a 40m x 50m pitch. The goal is to keep the HR between 83-90% of MHR perform these for 4 minutes on and then rest @ HR 70% of max for 2-3 minutes and repeat 3 more times. Or you could design a soccer specific dribbling course complete with hurdles, cones etc. You could perform aerobic strength work in a circuit fashion or an aerobic jump series.

**Q: What type of strength exercises do you use basketball and soccer players ages 12-14 years old? Also, how many times a week do you perform strength exercises?**

A: For athletes between 12-14 I would focus the strength work on body weight circuits 1-3 times per week. In addition to these sessions take time out to begin teaching them the basics of jumping properly, landing correctly, running mechanics.

For the body weight circuits you could set them up in 6-8 stations for reps of 4-12 per location and make sure their form is spot on. They should never go to failure on any of these exercises so make sure they leave 2-3 in the tank. You could use the following sequence:

1) Pull ups with help by green or purple band
2) Box jumps on to a 12-18" box
3) Walking lunges x 20yds
4) back raises or reverse hypers
5) lying reverse band curls
6) Pushups
7) Squat jumps in place
8) DB or EZ curl bar curls
9) Hovers both side and front
10) Band pull-aparts

The list is endless perform this circuit for time say 25 minutes then do a 5 minute cool down and you are done.

Also make sure your athletes never neglect their skill!!!!

**Q: I wanted to ask you whether you had any recommendations on what exercises to perform to strengthen the ankle area?

I am flat footed and have pretty small ankles supporting around 210lbs. I've started to play a little "recreational" soccer with colleagues for work and generally find that I am susceptible to rolling and / or spraining my ankle.**

A: You could use a green band and wrap it around the top of the foot twice and then pull back to put as much tension on as you feel comfortable. Then perform planter flexion and dorsiflexion as well as inversion and eversion you could do 25-50 reps per exercise. You can also do the same exercises using a loaded barbell on the ground with a 45lb on each side and pushing it and pulling it back with your feet as well as laying a bar down in the corner with no weight on it and then out front have a 45 lb plate on and then do the inversion and eversion exercise this way. Or you could do the same exercises with a ball suspended from a low hanging support.

**Q: When starting training with a new athlete how do you determine initial volumes for training resistance/aerobic etc? Do you start with an educated guess and then measure their ability to adapt via the Omega Wave or do you have certain volumes that you typically start with then adjust as necessary.**

A: This is very complex question but will give you some very basic guidelines we use.

After initial Omegawave test and physical testing (VJ, 10 sec jump test, Broad jump, 10/20m sprints, max pushups/chin ups, squat form, bench form, hamstring strength, low back strength, plank strength, plus we put them through a very basic training session to determine will and determination) the program is built. Then after first 1-2 sessions we will re-test OMW to see how athletes are recovering to new stress loads and then we re-adjust or keep going on course. We also adjust based on questions we ask them throughout training, before/after, and by watching them attempt certain exercises.

Most of the athletes we see are under-trained so they will adapt to the simplest training programs. Others and this does not happen very often are over-reaching to a point that rest/recovery, easy training, and other non-invasive means will allow them to show large improvement as well.

Hope this gives you something to work with. While it may seem like a simple question you asked it is far from it.

**Q: I believe you've mentioned before using high volumes of basic jumps to prep for alactic power/capacity work. How much volume exactly do you recommend?**

A: The volume we use will differ between our bigger and smaller athletes. Right now we have some OL/DL who are doing 300-400 foot contacts per week and our smaller athletes 400-500 foot contacts per week.

Do I recommend that much it will depend on developed the athlete is, capacity to do the work (some may only be able to handle 100 fc per session) so visually watching them perform will also predict volumes.

Examples of different jumps might be body weight squat jumps, box jumps, low reactive jumps on 12" box, side-side over line, back and forth over line, lateral jumps over low hurdle of 12-18", ankle jumps and so on.

**Q: 1.Is it ever appropriate for American football players to do medium intensity aerobic capacity work (such as lunge walking or step ups) in order to build a base for more intense work, or should they always stick to high work aimed at the oxidative capacity of the higher intensity fibers (sled sprints, hill runs)?

2.Is it okay to follow alactic power work (sprinting or jumping) with aerobic capacity work, in the same training session, or should they always be kept separate.
Thanks for your time.**

A: 1.Is it ever appropriate for American football players to do medium intensity aerobic capacity work (such as lunge walking or step ups) in order to build a base for more intense work, or should they always stick to high work aimed at the oxidative capacity of the higher intensity fibers (sled sprints, hill runs)?

A. Yes it is very appropriate and I believe they should do the oxidative work for slow twitch muscle fibers with squats and bench press as well. There needs to be a balance between oxidative and glycolytic (efficiency and power depending on the sport). If we increase the size of the slow‐twitch, it can produce just as much power as fast‐twitch and less price to pay on the field because they’re purely oxidative.

2. Is it okay to follow alactic power work (sprinting or jumping) with aerobic capacity work, in the same training session, or should they always be kept separate.

A. Make sure to perform them in different sessions always.

**Q: Could you please describe the differences in the training means for developing the glycolytic muscle fibers and the oxidative muscle fibers. They both seem very similar to me i.e. repeated sets to failure followed by around 60s rest. Is the only difference in the loads used?**

A: Some of the differences between these two methods are as follows:

The oxidative work is performed with 30-70% of 1RM, there is complete tension throughout the entire lift to create local hypoxia (2 sec lowering, 2 sec raising but never lock out), go to complete failure for time between 30-60 seconds, and the rest is between 30-60 seconds. The rest between series is 5-10 minutes and you can perform anywhere from 4-12 series. You must allow 3-4 days between sessions and when you perform the second session of the week (stimulative) only perform 1/2 the series volume you did on day 1.

Glycolytic work is performed using 70-90% of 1RM, there can be a relaxation phase at the top, you will take each set to failure and you only get a 1 minute rest between sets. You will only perform 4-10 sets on day one and on the second workout of the week (stimulative) you will only perform half the volume. I would only perform this work for 6 weeks max otherwise you will go into exhaustion which will cause poor adaptation.

With both of these methods I cannot stress enough your preparation leading up to attempting these. Athletes think they are tough but once they commence this training all bets are off.

I am in the process of writing a sport specific conditioning book and these methods will be discussed in more detail as well as other practical ways to implement other training means to produce certain adaptation, not only in the weight room but specific conditioning means.

**Q: Do you think you would be able to explain the differences between developing the capacities of the muscle and the heart? My assumption is that both would be in the same HR zone, but using different means, i.e. training the capacity of the muscle you might use a movement that uses more of the active musculature specific to the sport, and for the heart it might be more general work, but I don't know if that is right. If I am on the right track, would training say the aerobic capacity of the muscles also train the heart, or would it not be the same?**

A: There is a big difference in their development. To develop the power of the cardio-respiratory system you need to develop hypertrophy of the heart muscle itself and the way that this is accomplished is through anaerobic-glycolytic working conditions i.e. intensity (including heart rate, duration of activity, rest periods, and number of reps which exceed your anaerobic threshold for example my AT is 164 and for Anaerobic Development work based on the Omegawave I need to work with HR between 171-177) and allow for enhancing protein synthesis in the muscle cell and increases the density of the mitochondria which increases the aerobic capabilities of the heart.

This in no way justifies S&C coaches having their athletes run 300 yd shuttles, gassers, half-gassers and so on. First athletes who undertake this type of method must have a large base of fitness, a clear reason why they are doing it, and the exercise must be appropriate for the sport.

To train the aerobic capacity of the muscle for slow twitch (oxidative) you need to perform the bike rides, step ups, and or lunges I have spoken about which is designed to produce hyperplasia of mitochondria and for the oxidative capacity of the fast twitch you need to perform uphill sprints, sled sprints, etc. All of this type of work is done under the anaerobic threshold because you do not want to produce acidosis (high concentration of hydrogen ions) which leads to the destruction of the mitochondria.

Here is a one example of how we develop our young athletes. All of the weights are based on % of body weight and do not go above 80%. My belief is strength is the easiest to build down the road. Most of the work performed is with the athlete’s BW. There is no need to load athletes between the ages of 14-16 with excessive external loads. Have them perfect form first.

Training Block #2:
Duration: 4-5 Weeks

Warm up Active: Basketball, tag, keep away etc.
Warm up Dynamic:
Hurdle mobility:

Speed work (Day 1 & Day 3) Weeks 1&2
1) 8 x 10 yards (rest = Full recovery)
2) After completing last 10yd rep rest 2-3 minutes
3) 5 x 15 yards (rest = Full recovery)
4) Rest 2-3 minutes
5) 1 x 20 yard sprint

Speed work (Day 1 & Day 3) Weeks 3&4
1) 4-5 x (10,15,20) Rest 3 minutes between each distance.

Jump Training (All Days) Weeks 1-4/5
1) Medial Hops 3 x 10
2) Lateral Hops 3 x 10
3) Straight on Hops 3 x 10
4) Box Jumps up to 28” box 3 x 10 (make sure to step down softly after each rep) Rest 1-2 minutes between sets

Weight Training Day #1
1) Squats + Wk-1 4x6+125lb; Wk-2 4x5+135lbs; Wk-3 3x8+115; Wk-4 5x3+155lbs
2) Bench Press 8 x 3 + 105lbs Rest 1 minute between sets
3) Pushups with feet elevated on bench 12.10.8
4) Split squats + body weight only 20.18.16

Weight Training Day #2
5) Bench Press Wk-1 4x6+110; Wk-2 4x5+125lbs; Wk-3 3x8+105lbs; Wk-4 5x3+135lbs. Rest 2-3 minutes between working sets.
6) Squats 9 x 2 + 115lbs. Rest 1 minute between sets
7) Split Squats + body weight only 16.14.12
8) Pushups feet elevated 10.8.8

Weight Training Day #3
9) Squats + Wk-1 4x6+125lb; Wk-2 4x5+135lbs; Wk-3 3x8+115; Wk-4 5x3+155lbs
10) Bench Press 3xfailure + 105lbs Rest 5 minute between sets. Keep track of weekly record.
11) Pushups with feet elevated on bench 14.12.10
12) Split squats + body weight only 14.12.10

**Q: A little more info that I inadvertently left out - I currently do cardiac work 6 times a week. I will definitely add 1 or 2 longer sessions a week, keeping my bpm between 100-120 per your advice.

As for the prowler, as anal as I am using the heart rate monitor with my cardiac work, I've never worn it doing the prowler. My prowler pushes are 30 to 40 yards long, between 5 and 8 trips total, high handles/low handles (alternating down and back). I have not induced vomiting, although I generally feel terrible for a while afterwards. Rest periods are usually a minute or two, just enough to catch my breath. My goal with the prowler is somewhat vague - improve my conditioning and aid in some fat loss. Is it a good idea to keep these in the program, but make sure my heart rate stays under my AT? I'll estimate my AT for now, but plan on getting a stress test per your recommendation.**

A: On the prowler how long are the reps taking you? Are you adding weight to it? It sounds like the duration and the constant tension is causing these to become anaerobic. Here is a suggestion, find a hill or use a sled with weight (start with 10-25 lbs) and run full out for 5 seconds or less (these must be a maximum effort) keep your HR under your AT, then after 45-60 seconds repeat again and do 15-20 reps. These will improve the oxidative capacity of fast twitch fiber. These will be far easier for you to perform and far more enjoyable. Keep me updated on how these go for you and do them 1-2 times per week and make sure to rest 3-4 days in between.

**Q: With an AT of 157, can you suggest a HR range for aerobic capacity work with step ups?

Also, within this range should the goal be to stay as close to the exact middle of the range as possible, or to vary from the low end to the high end, or something else? I ask because a difference of 10 or 15 bpm can be quite significant and it seems like the training effect might vary greatly from staying at the low end of the range to staying at the high end, especially when the AT is right in that range.**

A: Keep your HR between 147-160 bpm.

You want to try and work as close to 160 bpm as you possible can.

Also for your cardiac work I would stay between 105-132 bpm.

Keep me updated on how these sessions progress. Keep the work between 5-20 minutes and rest periods between 2-10 minutes or HR drops below 120 bpm. Keep volume between 60-90 minutes (including rest periods). Keep your rest periods active i.e. walking, abs, dynamic stretches, etc.

**Q: Reading this site, there are those who prefer faster/interval cardio versus steady-state cardio for a longer time. I'll admit that I prefer to "get it done" and would rather run hills than do the elliptical. That said, I am wondering if there are more underlying benefits that come with steady state conditioning. I get the whole idea around, "what are you training for," but disregarding fat loss, athletic prowess, etcetera, and coming from strictly an overall health perspective, what do you think is best when it comes cardiac development? Should it be slow, interval, or a combination?**

A: To answer your question you must define what you are training for so for example you mention "faster/interval cardio vs. steady state" What is the adaptation you are looking to accomplish? I have written about this before to develop the size or efficiency of the left ventricle you must work between HR of 100-120 and to develop the strength work between HR of 120-140. The faster the heart beats the stronger it is going to become. So when you say either term "steady state" or "faster/interval cardio" they should be determined by heart rate and adaptation you are looking for.

The benefits of a properly developed cardiac system are as follows: Higher vagal tone which leads to longer life span statistically, better sleep, higher quality workouts and faster recovery, better circulatory system, lower resting HR, higher heart rate reserve (MHR-RHR=HRR).

To develop the cardiac system you only have to work between the HR described above. This can be accomplished through power walking, jogging, bike rides, weight lifting, body weight circuits, medicine ball work. The heart rates are the key. Like you could do intervals of say a minute at 120 then up to 140 for 1 minute again keeping this within the zones you accomplish the cardiac adaptation.

**Q: In terms of not only reducing bodyfat, but for lowering a resting heart rate and reducing blood pressure, would you say that it's important to have a mix of both aerobic and anaerobic conditioning? Any general guidelines in terms of how much of both for someone trying to work on the three things I mentioned?**

A: First make sure your diet is in line for reducing body fat along with having a good weight program in place.

With regards to lowering resting heart rate, reducing bp I would first recommend a concurrent block of cardiac development working in zones of 100-140 bpm 3-6x per week for 20-60 minutes per session, 2x weight training which will included development oxidative capacity of slow twitch fiber through special lower/upper body exercises. Then in the second block of training you can begin to incorporate heavy resistance bike rides, walking lunges, or step ups but you must keep this work under your anaerobic threshold and for weight training you could begin doing alactic/anaerobic work with proper rest periods and volume.

I would say only after 4-8 months of solid base training would I even consider anaerobic/glycolytic work and you better understand how much pain you will have to endure (VO2 max sessions), have understanding of proper volume, rest periods, and frequency of these sessions (Last government employee could only do these once every 10 days) and I would only do this for 3-4 weeks tops and then recover the mitochondria through a restoration block.

**Q: I've seen you use heavy resistance bike rides and step ups for oxidative capacity. Do you ever do bike workouts for aerobic capacity? In which situation do you use one over the other?**

A: The type of training you are talking about can be done on the bike. To improve the aerobic capacity work must be done at Vo2 max and the duration of activity must be specific to the type of training adaptation you are looking to achieve along with proper rest periods. So improving the protein synthesis of the muscle cell itself through hypertrophy work of the heart. For this to happen you must train in the anaerobic glycolytic zone. So you will need to be working above your AT for 60-120 seconds and then rest for 2-3 minutes. I would start out with maybe 5-10 reps and only do this work every 7-10 days.

One word of caution here you better have a high level of fitness, have a mind of steel and be prepared to suffer.

Also make sure to use a lower estimated AT if doing them on the bike compared to running (drop by 10-15 beats), unless you have a sport specific AT for cycling.