

Natural Performance Enhancement:
The Application of Chinese Medicine to
Optimize Performance in Endurance Sport

Jeremy M. Breach, Master's Candidate
Seattle Institute of Oriental Medicine
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Sport has been a useful way for people to increase their mastery of nature and the environment. After a look at the history of sport to emphasize its importance in medicine and culture, focus will turn to endurance sport, specifically triathlon. Commonly practiced training methods will be overlaid with knowledge gathered from Chinese medical study and practice, as well as clinical and laboratory findings with the aim to support the competitive triathlete.

Individual sports, such as wrestling and archery, have been practiced worldwide since ancient times. Activities necessary for food and survival became regulated activities done for pleasure or competition on an increasing scale. Sport has been increasingly organized and regulated from the time of the ancient Olympics (776BC-393AD) up to the present century. Among the Greeks, the games were nationalistic in spirit; states were said to have been more proud of Olympic victories than of battles won.

A time of truce was declared during the Olympic Games, as military actions and public executions were suspended. This was to enable people to congregate peacefully and to compete in a civilized and respectful atmosphere. That being said, ancient Olympic sports were based in war practices. At first, competition was confined to running, but over time new events were added: the long run (720 B.C.), when the loincloth was abandoned and athletes began competing naked; the pentathlon, which combined running, the long jump, wrestling, and discus and javelin throwing (708 B.C.); boxing (688 B.C.); chariot racing (680 B.C.); the pankration (648 B.C.), involving boxing and wrestling contests for boys (632 B.C.); and the foot race with armor (580 B.C.).

Today, the Olympic Games are the world's largest pageant of athletic skill and competitive spirit. They are also displays of nationalism, commerce and politics. These two opposing elements of the Olympics are not a modern invention.

Historically, the games were held not simply as a sporting event, but as a celebration of individual excellence, cultural and artistic variety, and a showplace for architectural and sculptural innovation. Fundamentally, it was a time of gratitude and respect for the Gods of the Greek religion. The games are named after Mount Olympus, a sacred place where the Gods were said to live.

Which brings mention of Galen (129-210 A.D.), a western medical authority of antiquity, rivaled only by Hippocrates. It is a basic tenet of medical education that the student must study the normal, healthy system to understand pathology, and Galen's study and achievements are a prime example. Upon return to Bergamum (modern Turkey) around 157A.D., he spent 4yrs at a gladiator school as a physician. This provided him an excellent understanding of normal anatomy and physiology at a time when dissection was forbidden. He describes his experience of treating large amounts of trauma and wounds, many of which fatal, as "Windows into the body." His writings on anatomy became the mainstay of medieval physicians' university curriculum. In the 1530s, Vesalius, a Belgian

anatomist and physician translated the writings of Galen to make *De Humani Corporis Fabrica*, largely a study of normal anatomy and physiology. It is also of note that Galen's study of medicinal formulation, known as Galenic formulation- paved western research into how the body absorbs different substances and laid the groundwork for principles of compounding (mixing) meds to alter absorption.

From the Hippocratic treatise *On the Nature of Man*, Galen took the doctrine of the four humors- the view that the fundamental constituents of the human body are blood, phlegm, yellow bile, and black bile, reducible in turn to the basic qualities of hot, cold, wet, and dry. The four humors, he argued, combine to form tissues, tissues combine to form organs, organs unite to make up the body. Disease was seen to be based in either disequilibrium among the humors and their constituent qualities or with a specific state of particular organs. One of Galen's principle innovations in the art of diagnosis was to localize disease by identifying specific afflicted organs. For purposes of diagnosis, Galen leaned especially on the pulse and examination of the urine. Galen's physiological system had even more complex roots. Plato had argued for a tripartite soul, consisting of a superior (read: rational) part and two inferior parts (associated with the passions and appetites), lodged respectively in the brain, chest and the abdominal cavity. Galen adopted this scheme, expanding the three faculties of the soul identified by Plato into a tripartite organization framework for physiology. In this scheme the brain (The seat of the souls rational faculties) was identified as the source of the nerves. Galen argues that the nerves contain psychic pneuma, which accounts for sensation and motor function. The heart (the seat of the passions) became the source of the arteries, which convey life-giving arterial blood (and vital pneuma) to all parts of the body. Galen also identified life with innate heat. The principle seat of the life-giving heat is the heart. In the Galenic system, lungs and respiration perform the function of maintaining the right degree of vital heat.ⁱ

While the west has abandoned notions of diagnosis of the body through the pulse and vital substances in the body, such as Galen's vital pneuma and heat, students and physicians of the Eastern styles of medicine will quickly see obvious ties between Galenic physiology and the Chinese notions of Blood and Qi, Yin and Yang, Heat and Cold that date to the times of the *Nei Jing* and *Shang Han Lun*. While the Western tradition has been largely exclusion-based, continually aiming to move "forward" and/or "away" from ideas of the past, the Eastern traditions have been largely inclusive, aiming to build upon a framework laid by the ancients, modifying and adjusting to suit the lifestyle of the time, while integrating modern advances in thinking and practice of medicine. This writing becomes a consideration of the modern extreme athlete through the ancient elements of health, health cultivation, and disease. A return to these elements is warranted in considering the use of Chinese medicine's role in optimizing extreme athletic performance.

Historically, athletes have provided a lead-edge for advances in preventative healthcare and health optimization. In the 19th century, with physical culture, the "movement cure" (calisthenics), and "fresh-air living", more physically challenging approaches to fitness were coming to the fore. Physical culture brought, from Germany to the U.S. in the 19th century, the introduction of the first modern gymnasiums. It is the promotion of muscular growth, strength and health through various physical exercise regimens like resistance training, bodybuilding, sports, stretching, and posture correction

techniques. Here we see the beginnings of an athletic movement leaning toward a wholistic, natural, healthminded lifestyle. Athletes, with heightened attention to the workings of their bodies and frequent examination of how their bodies react to dietary, environmental, and exertional changes, provide an excellent “window” for understanding and applying a medicine aimed at optimizing health. In fact, a clinical practice specializing in treatment of the modern endurance athlete can be likened to the ancient practice of Chinese medicine. With a higher incidence of trauma and repetitive stress/overuse injuries, a patient base that is regularly affected by exposure to environmental factors such as wind, precipitation and dryness, hot and cold temperatures, as well as consideration of diet aiming to sustain daily bouts of prolonged work (riding a bike great distances, building the Great Wall of China, or harvesting grains), the parallel is obvious. Triathlon is a modern example of high fitness- today’s gladiator and ultimate athlete. A brief look at the history of triathlon will help to elucidate this.

Triathlon 101

The origin of triathlon has been anecdotally attributed to the 1920-1930s French "Les trois sports", a 3 km run, 12 km bike and a crossing of the channel Marne, by Ironman and triathlon historian Scott Tinley. Since the 1930s, very little was heard about triathlon until 1974 at San Diego's Mission Bay in Southern California, where a group of friends began training together. This occurrence is well-documented and was not based on the French events. Amongst them were runners, swimmers and cyclists and before long training sessions turned into informal races.ⁱⁱ The first swim, bike, run events in the U.S. were held by the San Diego Track Club, to break up the normal grind of training for marathons and 10k runs. One participant, John Collins, took the triathlon concept to Hawaii and eventually combined three of Oahu’s endurance events- the Waikiki Rough Water Swim, the Around-Oahu Bike Ride, and the Honolulu Marathon into one race- the Ironman, in 1978. The Ironman triathlon consists of 2.4miles swimming, 112miles biking, followed by 26.2miles running. By 1980 there were hundreds of participants and the event was covered on ABC’s Wide World of Sports. In 1982, the dramatic coverage of an athlete crawling on her hands and knees to a second-place finish at Ironman triggered an explosion of interest and participation. This was Julie Moss desperately trying to get to the finish line, looking like a "punch-drunk" boxer as she staggered ... then fell ... then got up and staggered some more ... then fell ... then got up ... then fell ... and eventually began to crawl towards the line. This was the event that inspired millions of people, the event that started so many people in the sport, the event that has led to the expression that "just finishing an Ironman is a victory." 1982 was the last year that there was no qualifying requirement needed to compete in Ironman, and also saw the sport’s first national publication, *Triathlon Magazine*, a national organization, *U.S. Triathlon Association* (later named *USA Triathlon, USAT*), and its first national racing series, *the U.S. Triathlon Series*.

By 1989 triathlon had formed an international governing body- the International Triathlon Union (ITU). Twenty-five nations were represented at the founding congress of the ITU in Avignon, France. The focus of the ITU was to gain acceptance by the International Olympic Committee (IOC) and have triathlon accepted on the Olympic program. A World Triathlon Championship was the first step in the process, held in Avignon later that year. The race was held in the international standard 1.5k swim, 40k

bike, 10k run format. This is the format used in Olympic triathlon competition. The Ironman may be the sports most recognizable event, but the Internaitonal/Olympic distance is the sport's most popular.

In 1995 the Pan American Games included triathlon. The Goodwill Games Triathlon was held in 1994, and in October of that year, triathlon was named to the Olympic program as a medal sport for the 2000 Games in Sydney, Australia. In Sydney, triathlon was the premier competitive event, highlighting the popular outdoor, active lifestyle of Australia. Since then, there has only been growth in the sport's participant and fan involvement. The sport of triathlon was kept in the Olympic games for the 2004 Athens Olympics and will be held in the Beijing Olympics of 2008.

Common triathlon distances and finish times (parentheses):

Sprint- 750meters swim, 20km bike, 5k run (1-3hours)

Olympic- 1500m swim, 40km bike, 10km run(2-4hours)

Ironman- 3.8-km (2.4-mi) swim, a 180-km (112-mi) bike 42.2-km (26.2-mi) run (8-15 hours)

The sport is also held in Half-Ironman distance (half of each swim, bike, and run leg,) and is also often modified to suit the constraints of a particular landscape with shorter/longer distance for any of the three events. An IronKids race program has seen over 40,000 youth participants since 1985. Triathlon has also gone "offroad" by including mountain-biking and trail-run segments with the popular Xterra race format.

It is estimated that between 150,000-250,000 people try a multi-sport event in the United States each year. This includes triathlons (swim, bike run), duathlons (run, bike, run) and aquathlons (swim and run).ⁱⁱⁱ It is also notable that USA Triathlon's female membership has increased from 11 percent in the early 90s, to about 29 percent today. This is especially impressive considering a survey by the Sporting Goods Manufacturers Association that found women prefer non-competitive events to maintain physical fitness.^{iv} It is because of today's "ultimate athlete" view of triathlon that we have seen such phenomenal growth of the sport. And increasing participation (annual race license and annual membership data are charted below) has diversified who is involved. Triathlon is a very tangible, attainable sport, not limited to Olympic calibre athletes, and so we see another general strength that Chinese medicine cannot help but offer- the inherent consideration of the whole person, including individual constitutions, body types, dietary/gastrointestinal tendencies, workloads, breathe patterning, and emotional predispositions, to name a few. Conventional training plans and support for the athlete can be more individualized and suited to a specific, dynamic athlete when viewed through the practices of Chinese medicine. And such a dynamic patient base makes for very interesting study of medicine and the human body. As we will see, it also helps us return to the very earliest writings of Chinese medicine, much of which we take for granted or simply do not understand because it is so different from our modern way of living and thinking.

Membership Activity (full-year licenses)

1993: 15,937
1994: 15,194
1995: 15,620
1998: 16,461
1999: 19,060
2000: 21,341
2001: 29,886
2002: 40,299
2003: 47,373
2004: 53,254
2005: 58,073
2006: 84,787

<http://www.usatriathlon.org/sitecore/content/Secondary/AboutUSAT/Demographics.aspx>

Breakdown of 2006 annual membership per age group

(Numbers are approximate)

Age- group	Female	% of age- group	Male	% of age- group	Total in age- group	% in relation to all current members
under 16	6806	44.61%	8263	54.17%	15255	17.99%
16-19	747	37.18%	1257	62.57%	2009	2.37%
20-29	4788	43.82%	6135	56.15%	10927	12.89%
30-39	8915	34.23%	17116	65.71%	26046	30.72%
40-49	6446	31.11%	14260	68.83%	20718	24.44%
50-59	1893	24.81%	5737	75.18%	7631	9.00%
60-69	313	17.19%	1504	82.59%	1821	2.15%
70-79	36	13.14%	238	86.86%	274	0.32%
80 plus	1	5.26%	18	94.74%	19	0.02%

<http://www.usatriathlon.org/sitecore/content/Secondary/AboutUSAT/Demographics.aspx>

The Fundamentals of Endurance Performance

Great fitness results from a large aerobic capacity (how much oxygen the body can process at maximal work, VO₂ max), a high lactate threshold (the level of submaximal work at which lactate begins to accumulate in the blood), and an excellent economy of movement^v All of which are trainable. Beyond the ability to train long hours, 6-7 days/week, what are other limiting factors in high-level sport? Some argue for fitness, some for skills, techniques and strategies, and others for motivation and arousal.

All these factors are important, with their individual contribution depending on the sport, event, age and experience of the athletes. One factor often overlooked is the threat of illness. The athlete must:

- Avoid illness- resist illness/increase immunity
- Prevent and heal neuromusculoskeletal injury
- Prevent overtraining via recovery support
- Take time off and recover annually

Triathletes train up to 40 hours per week, with the majority falling somewhere between 10 and 20 hours per week. As I have suggested, regular, prolonged exposure to elements brings a situation akin to ancient times. Triathlon has been described as an “ecological” sport in that participants race through water and land courses, each with their own particular flavors and subject to various and often changing weather patterns. Starting with a swim (introducing an element of dampness), transferring (wet) to the bike segment (damp, now exposed to wind), and then a run through the condition of the day (hot, cold, wet, dry) the athlete runs a gauntlet of environmental pathogens that are the realm of Chinese medical terms for pathology (Wind, Cold, Damp, Warmth, Heat, Dryness). But the overall picture of the athlete’s health, considering the hours, weeks, months and years of training leading up to competition, is one of great energetic expenditure and therefore overall deficiency (虛). Considering ZhuangSi’s famous quote that “Qi gathered together is life; Qi dissipated is death,” the practitioner treating triathletes must look at ways to support and maintain the Qi, Blood, Yin, Yang, and Jing.

In the *Su Wen Great Treatise on Yin and Yang* we see “Heaven has four seasons and five phases” (天有四五行.) If we move from the popular 5-element “star” organization of the elemental/organ correspondences to the cosmological cycle, we see the digestive capacities (largely Earth-oriented) of the body move to center stage, highlighting their importance. The other four elements (Water, Wood, Fire, Metal) are then correlated to the seasons. The relationships of organs and pathologies to their respective seasons provide a very close match to the periodized training phases of the annual training cycle recommended by Joe Friel in his *Triathlete’s Training Bible*. Not only has periodization been shown to be a successful approach to multisport training^{vi}, Friel’s book is also the most widely sold book on triathlon training in the U.S. Therefore, it is a good indicator for how most triathletes are structuring their training year.

A quick summary shows four basic periods that fill the training year: First, there is a 12 week “Base” phase, focused on low intensity, high volume exercise. Arguably the most important to the endurance athlete’s training regime, the Base period is used to build technical skills for efficient movements as well as increase cardiorespiratory function (VO₂ max, the ability to use more oxygen over time). The Base phase is followed by an 8 week “Build” phase, where intensity is increased and volume is slightly decreased. Fundamentally, this period of the year raises the level of exertion that can be sustained before the muscles begin to burn with accumulations of lactic acid and metabolic waste products. The increased intensity of the Build phase prepares the athlete for the goal of the year, a variable-length, “Competition” phase where all systems are integrated for race season. Although triathlon’s increased popularity and participation have expanded the race season across the globe to span the entire calendar year, most triathlons in the U.S. take place in the summer months, when the roads have thawed, the

lakes have warmed, and the weather is more amenable. Race season is followed by a period of rest and recovery where the body is allowed to recuperate from the demands of the past months of physical and mental strain. Later we will see that the importance of annual recovery time cannot be underestimated for the athlete hoping to continually increase performance and maintain health over an athletic career. If we place an individual's race season at the top of the cosmological cycle, in the position of Fire/Summer, Friel's periodized year relates very well to the seasons, with a winter of base training, a spring of increased intensity and perhaps early season racing, racing in the summer and recovery in the fall.

EARTH (Center)

At the center of the plan is Earth, largely related to the body's digestive capacity. First, a look at the source of post-heaven qi, the Taiyin Spleen and Lungs, where transformed (化) food and drink combine with air to create gathering qi (宗气), a process that is central to supplying food and oxygen to tissues and, as stated above, is central to athletic efforts. There is a very large industry committed to supplying athletes with carbohydrate-based performance and recovery drinks, consumed before, during, and after exercise. It has been shown very clearly that consuming carbohydrate during exercise both extends endurance and heightens performance, as well as helps to protect the athlete from infection. This is a very clear example of construction (营) and defense (卫) imbalance familiar to any practitioner of Chinese herbal medicine. And it can be seen in the conventions of professional cycling that, after racing through inclement weather, a mountain-top stage in Italy, for example, that the athletes must go indoors and protect themselves from wind, cold, and rain as this is a period of heightened vulnerability to catching a cold. But my first point comes here.

The sports drink industry has benefited greatly from the very real concept of "bonking" or "hitting the wall." Bonking can be defined as the depletion of glycogen and blood sugar while exercising. Symptoms include a dramatic reduction in performance and feeling disoriented and weak. Athletes are fueling a multi-billion dollar industry, perhaps to a fault. The use of too much or overly-sweet recovery drinks brings consideration of a quote from the 5th chapter of the Su Wen where, of Earth, "...Spleen grows the flesh... As a taste, it is sweet... Sweet damages the flesh" (脾生肉...在味为甘...甘伤肉...). High carbohydrate beverages induce the release of insulin. Some even aim to elevate the body's insulin response (in the short term, at least). The Su wen quote could be related to the long-term effects of insulin promoting the release of cortisol from the adrenal gland, with cortisol performing its function of breaking down distal flesh into protein used for fuel, reducing muscle mass and "damaging the flesh," but there is more. High glycemic index, insulin inducing drinks have been shown to have a negative effect on future glucose production. This understood through modern immunology, with a quick look at "myokines."

Myokines are cytokines released from muscle during exercise. The creation and release of myokines is enhanced when muscle glycogen is low and inhibited by carbohydrate supplementation. An example of this is interleukin 6 (IL-6). IL-6 directly promotes skeletal muscle differentiation and regulates muscle substrate utilization, promoting glycogen storage and lipid oxidation.^{vii} The IL-6 gene is rapidly activated during exercise, and the activation of this gene is further enhanced when muscle glycogen content is low. In addition, carbohydrate supplementation during exercise has been

shown to inhibit the release of IL-6 from contracting muscle.^{viii} So we have a situation where qualities that we want more of (more efficient muscle, more fuel ready to be used), diminishing because of current practices and being explained to us by physicians from thousands of years ago. Racing has been described as “a battle of who can digest the most.” And this is both illustrated in terms of the in-race “bonk” as well as the daily stress that multi-sport training puts on the body in terms of digesting and assimilating enough food and drink to support high training volumes.

The breakdown of the digestive system is another common occurrence in the professional cycling *peloton* and is seen in triathlons as well. The ability to process food during exercise is central to endurance performance, and this can be challenging. In one study on gastric upset subsequent to a long-distance (IM) triathlon, there was a high incidence of GI sx (93% of all participants). 45% reported severe complaints, 7% abandoned the race because of severe GI distress. Stomach Cramps (10%), Intestinal Cramps (14%) Bloating 24%, Nausea 21%, Diarrhea 7%,^{ix} Many of these conditions are treated in the Chinese clinic daily and conventional medical approaches are nowhere near as sophisticated. Granted, the aforementioned study was based on subjects in competition, when it is too late for on-site Chinese herbal or acupuncture remedies, but the basic harmonizing and balancing strategies of Chinese medicine go far to optimize the processes of digestive breakdown and assimilation, and can be extended to support both the training and competitive endurance athlete. One illustration is the use of the traditional Huang Qi Stengthen the Center Decoction (黄旗建中汤), given to martial artists (who are performing their own form of endurance training, often training for multiple hours each day) in a placebo-controlled trial. Over a period of eight weeks, where the subjects continued to exercise as usual, the test group showed an average 5% increase in time to exhaustion as well as increased anaerobic threshold compared to the control group.^x

WATER

With Earth at the center of the diagram, the bridge from a discussion of the digestive process could continue at to any element/season in the cosmological cycle. A suitable bridge comes from Zhang Zhong Jing’s 200A.D. writing on infectious disease, the Shang Han Lun. Study has shown that disease of the Shaoyin channel (Kidney and Heart), in terms of Shang Han pathology and progression, assumes deficiency (虚) of the channel, and may be a result of Taiyin deficiency disease^{xi}. Not only do these statements provide a smooth transition for this essay and provide a justification of tonification (益), but it also provides a quick prelude to a discussion of athlete overtraining syndrome further on.

Endurance training is done at moderate intensities and duration is extended. Only a very small percentage of time in this period focuses on force or power. The great bulk of workouts are performed at an aerobic, conversational pace. The base period occupies roughly half of the annual training cycle, building the athlete’s aerobic exercise capacity through training of the lungs, heart, and fat metabolism systems. Physiologically, developing endurance improves performance because it trains the body to use oxygen efficiently (aerobic training), delivering it to the working muscles through the development of the capillary network and the entire cardiovascular system. It also trains the body to use fat as a preferred fuel—sparing stored sugar and glycogen and

minimizing post-exercise sugar cravings and potential over-consumption of calories. It is primarily through endurance training that the body develops an ability to use fat as a primary fuel. The utilization of fat as a preferred fuel for muscular contraction occurs below lactate threshold, or between heart rate parameters of approximately 50-80% of maximal heart rate. Although these percentages are just estimates and may vary widely between individuals, remember that once lactate accumulates, fat utilization is impaired. Endurance training also strengthens the immune system, reduces injuries, increases energy, increases efficiency and develops mental focus.

Late in this period, training volume reaches a maximum for the annual cycle. Although the international triathlon schedule is a year-round calendar, with races taking place each month around the country and around the globe, this phase is related to the Winter season here: poor weather conditions often do not permit racing or high-speed moves in the winter, temperatures in the lakes and streams do not permit open-water swims. The race season, for most, is still months away. If not confined indoors on treadmills and stationary trainers, the athlete is often exposed to the winter elements- low temperatures, and precipitation in the form of rain and maybe snow, often with cold winds and darkness. Here, the neuromuscular system is trained to perform movements efficiently, improving the economy of motion, one of the athletic goals mentioned above. Another result of these frequent and prolonged workouts is to train the body to burn fuel substrates in the most efficient manner possible. Work efficiency can be equated to mechanical work / chemical energy expended. This theme of efficiency, prevalent in the lifestyle of the multi-sport athlete with workouts juxtaposed on top of all the normal ins and outs of modern living, brings mention of the difficulties of Chinese translation through discussion of the character *bu* (补). Commonly translated as “supplementation,” where something is added to the deficient system, the Chinese medical scholar Tom Bisio has suggested that *bu* can also be considered in terms of repairing function, as in *bu tai* (补胎), a sound loan for repairing the function of a flat tire. If we think about supplementation in these terms, it becomes a matter of organizing or ordering the qi to increase function. We all assume greater health from exercise. It has been shown to reverse cardiovascular disease, typeII diabetes, prevent obesity, and treat depression, to name a few. By spending a few extra heartbeats, raising it while we exercise, the resting heartrate decreases a few beats (due to increased cardiorespiratory efficiency) for all of the time when we are not exercising. Most of these gains come from exercising at a low intensity, but well placed intensity intervals are necessary for anyone who wants to race competitively. This brings mention of another line from the Su Wen, where it is stated that “Vigorous fire weakens qi. Less fire invigorates qi.” (壮火之气衰。少火之气壮。) With base miles equating to the lesser fire, invigorating the qi through increases in metabolic efficiency, the fire still needs something to burn. In Chinese medicine, this is the Kidney qi, sourced in yin, yang and jing. Considering the needs of the athlete, it is the job of the practitioner to assess these for treatment. Considering the Su Wen quote in a different light, we can inform herbal practice: Vigorously warming, blasting type formulas such as Zhen Wu Tang or Fu Zi Tang are actually dispersive, used to blast out cold clogging up the works to revitalize processes. In treating to supplement the athlete, we do well to look to gentler formulas such as Jin Gui Shen Qi, You Gui, or Liu Wei Di Huang Wans to support the source. It is also notable that a quick look into the Yang Tonics section of Bensky’s *Materia Medica* or some other Chinese herbal text, many of

the yang tonic herbs, such as Du Zhong, Ba Ji Tian, Bu Gu Zhi supplement the bones and sinew- another goal of base training- stronger, more resilient musculoskeletal structures. Given the challenges that the body will face as workouts increase in intensity, it is wise to consider modifying formulas in this manner.

WOOD

The spring is the time of Wood. The zang organ of spring is the Liver. In the 16th Chapter of the Nan Jing, we see the Liver associated with twisted/cramped muscles (转筋), the limbs swollen and obstructed (四肢满闭), and a tendency towards anger (善怒.) Why is this?

While a relatively large volume of training is maintained, workouts begin to focus more on force, speed, and power. As triathlon is an endurance sport, the aerobic metabolism system is still a large focus here, but the build phase includes a slight shift in focus to the anaerobic system of energy production. Here the intensity of exercise exceeds the anaerobic threshold, where the aerobic metabolism is no longer able to supply enough energy and the athlete goes anaerobic, literally “without oxygen,” producing more lactate than can be buffered.^{xii} The buildup of lactate is associated with muscle stiffness and soreness both during and after workouts. The Build phase is associated with the spring season here- this is when the roads begin to thaw and many are excited just to get outside again and blow off some steam. The days are longer and there is more daylight and it’s time to see what a winter of constant training has brought in terms of physical ability. Many triathletes will start to compete in road cycling events here to push the intensity levels of their training further. If not sanctioned road racing, the training sessions’ intensity should still begin to move more toward competition-level exercise. Many will over-do it here resulting in minor (or major) musculoskeletal injuries which, if not treated quickly and appropriately, will linger and bring a certain physical and emotional flavor to the rest of the season. One study found that in triathletes, the most common injuries occur in the lower leg and ankle, knee, back, thigh, and shoulder. Other studies have shown that triathletes have an injury rate of 75%, but among those training for an Ironman-distance race, the rate is 91%.^{xiii}

Doctors at the healing center of Beijing Sports University use acupuncture to treat about 70% of the chronic and acute muscle injuries they deal with. Many sports doctors in China (and the U.S.) offer acupuncture for the treatment and relaxation of muscles. Li Quanyi, physician to the Chinese national gymnastics team gives every person on his team 15 minutes of electrical acupuncture treatment at least four times a week to ease fatigue and muscle strains. Cupping, internal and external herbs are also frequently used to stimulate circulation and ease aches and pains.^{xiv}

In *Pricking the Collaterals: Underlying Principles and Use in Recalcitrant Diseases* we see the case of 18 year-old female with an hours-old ankle sprain diagnosed as Blood stasis obstructing the collaterals. The treatment principle is to dispel stasis and unblock the collaterals. Bleeding cupping is performed and dark, purplish blood is expressed, corresponding to the stasis. When the procedure is finished, the pain has significantly decreased, along with the bruising and swelling. Jin huang san is applied. Two days later the bleeding treatment is again applied, after which the pain is basically gone. Jin huang san is applied again.^{xv}

Musculoskeletal injuries such as

- Neck Stiffness and Strain

- Rotator Cuff Injuries
- Carpal Tunnel Syndrome
- Back Sprain/Sciatica
- Pulled Hamstring
- Knee Pain and Injury
- Calf Spasm
- Ankle Sprain
- Plantar Fasciitis

all have related Chinese medical diagnostic patterns and treatments. Acupuncture has a great ability in the prevention and treatment of musculoskeletal injuries. Indeed, many insurance plans will only reimburse practitioners or subscribers for acupuncture treatments based on alleviating pain or treating injury.

Take the example of Brad, a 36 year-old engineer and category 3 road cyclist. He came to the early season training races very prepared and well-trained. He managed to get to the last lap of the 60 mile road race, although fighting leg cramps and spasms due to the heightened intensity which spring racing puts on the body. (This could be construed as insufficient Liver Blood...). As part of a four-man breakaway since mile 30, Brad stood a fairly good chance of placing well for the day. The break was caught and Brad decided to help a teammate in the final sprint, sprinting through cramping, painful legs. Weeks later, under any significant exertion on the bike, Brad experienced limiting pain in his right hamstring. He took it easy. He took time off. He stretched. He paid extra attention to his nutrition. But still, after two months, the pain remained. He came to a sports-oriented acupuncture clinic with a diagnosed second degree hamstring tear. This diagnosis usually takes 2-3 weeks to heal, but for Brad, it had been two months. Electro-acupuncture was applied to UB and GB points around the injured area for 3 sessions in two weeks, at 25-40 minutes each, and Brad was allowed to continue cycling in the meantime, but advised not to “push through” any discomfort, but instead to “back off” at the point where cycling became painful. This one round of treatments was able to turn the injury around for Brad and he was able to return to competitive form for a few more months of racing. With regular visits to the clinic, (maybe taking home a formula such as Shao Yao Gan Cao Tang?) the injury may have been prevented.

In the *Nei Jing*, when considering disease, it clear that it is very important to assess the channel. This is because there is a very close relationship of the channels and their organs. The contemporary Chinese acupuncturist, Dr. Wang Ju-Yi, has created a channel palpation method comparable to modern techniques of x-ray and diagnosis. In the SIOM clinic, various channel palpation methods are commonly used to check for something unusual that reflects the organ pathology. Palpation along the channel pathways often reveals the disordered state of this or that channel. These are palpable changes in the tissue, at the level of skin, muscle, ligament or tendon. Anyone who has experienced a stress fracture or bone bruise will agree that the bone level can be palpated as well. Dr Wang explains the channel palpation in terms of the fluids, *Jin Ye* (津液), relating their movement to the interstitium: “If the movement in these spaces is slow or irregular, over time there will be a little swelling or pooling in these spaces. It may accumulate & become a nodule.”^{xvi} A similar view is expressed by one of the founders of the Japanese style, Meridian Therapy, by Master Okabe Sodo. On the treatment of *Tsubo*,

reactive points, for neck and shoulder pain: “I first retain needles in neck and shoulders for 20-30.’ After removal, palpate to find *kyoro* (lumpy) or *kori* (hardness) reactions at a deeper level. When I needle these reactive points, the neck and shoulder tension clears up just like that.”^{xvii}

Irregularities in the channels lead to disease. Imbalanced use leads to irregularities. These imbalances are often related to the diet, emotional states, or lifestyle. The basic case is simple for endurance athletes- improper and excessive movements lead to altered, unhealthy stress(es) being placed on the fascia, muscle, sinew, and bone, and injury results. Injuries appear to happen fast, like wind. But there are small changes in the tissues that lead up to a full blown hamstring tear. Considering the conventional remedies of rest, ice, compression, and steroids (which actually weaken connective tissue!), truly, an ounce of prevention is worth a pound of cure. To optimize function in the “spring” is the only way to excel in races in the “summer.” We see in the fifth chapter of the Su Wen: “Liver grows the sinew. Sinew grows the Heart” (肝生筋。筋生心。) There is a chance that this relates to the histological similarity between the tissue of the sinews (ligament, tendon, fascia,) and those of the blood vessels and valves of the heart, but in Chinese health philosophy, the mind and body are connected. Healthy structures allow for pleasure- in the form of running, biking, and swimming really fast!

FIRE

All of the weeks and months (often years!) of training come together at this point. This is race season. This is what it is all for. Fitness is at the highest level. All systems are primed. The large volume of hours spent training has been tapered away, transitioned to maintenance and select, race-intensity workouts in order to continue to adapt to the intensity of racing. This phase is associated with summer. Lakes and rivers have warmed up sufficiently to allow for training and racing in open water. In the northwestern U.S. there is a race every weekend from June to September and many athletes will be competing in several events over the summer. Races are often prioritized in terms of their importance to the athlete and categorized for how they fit into the annual training cycle. Often there will be racing or race-quality workouts on back-to-back weekends, placing the highest demands of the year on the body. While rain and cold and darkness place certain stresses on the body that are the challenges of winter training, there is a new set of stresses to adapt to in the summer- heat and fluid damage. The potential of exercise in hot and humid conditions to elicit fatigue, exhaustion and heat stress is well known. Exercise in the heat may also have consequences for immune function.

Overtraining and burnout are a common experience in the summer. The need for recovery and the prevention of burnout should be emphasized. Most recreational athletes are more used to the notion that an elevated heart rate is the sign of overtraining, specifically during rest, and they’re right in their thinking. Fewer athletes are aware of, or ever experience, a heart that cannot beat fast enough. But professional triathletes are very aware of this phenomenon, especially those who engage in Ironman-style training and racing. The question is exactly why this happens and what the physiological mechanism behind it might be.^{xviii} There is no objective marker for determining that an athlete has gone too far and would do better to take it easy for a while. A good example of how the practitioner can help is illustrated with a story about my friend Chris.

Chris is a professional triathlete. Chris has had great success (and a lot of fun) at the annual Wildflower Triathlon festival in California and has placed it high on his priority list for the 2007 race season. The “hitch” is, there is a race that he is required to do for his sponsors, in Colorado, the following week and has national team qualifications not long after. Should he go to do Wildflower a week before the Colorado race? To be able to do both means a lot to Chris, but he is a professional and wants to make sure to have a good race in Colorado for his sponsors’ sake. Normal training advice would take a look at Chris’ training and history, especially in the past few weeks, as well as the activity of his heart rate in training sessions leading up to Wildflower. This is where the acupuncturist comes in: who better to gauge the state of the ticker than a professional who specializes in discerning the quality of the pulse? A cardiologist or exercise physiologist? Many styles abound for pulse diagnosis in Chinese medicine, but the basic qualities of weak(弱) or strong(强), replete(实) or deficient(虚) are the domain of any practitioner of who uses the pulse. Is Chris overreaching? Is he adequately recovered? What is the state of the Qi? The Blood? The Fluids? The four examinations can help provide a solid recommendation for what to do, and the pulse, related to the heart (and the Heart) is an especially valuable diagnostic criterion for the practitioner working with athletes.

In the Su Wen, of Heart, “at heaven, is heat, at earth, is fire, at body, is pulse.” (在天为热，在地为火，在体为脉). It is no surprise, then, that the Chinese herbal tradition has paid some attention to methods of bolstering the pulse and encouraging its strength. We see formulas such as Zhi Gan Cao Tang from the Shang Han Lun, modified to be known as Fu Mai Tang (Return the Pulse Decoction, 复脉汤) in the Wen Bing Tiao Bian, having the warming ingredients removed for a greater aim at nourishing the blood, preserving yin, generating fluids, and moistening dryness.^{xix} Another formula is Sheng Mai San, which is popularly used in China as preparation for a trip to the Himalayas. From Sun Si Miao’s *Qian Jin Fang* we see recommendation for Sheng Mai San: “In the summer months heat injures the vital qi (元气). When there is shortness of breath, fatigue, thirst, copious sweat, and the Lungs are deficient and shocked, it’s suitable to use Ren Shen, Mai Dong, Wu Wei Zi type herbs. This is Sheng mai San.”

Lab studies demonstrate that Sheng Mai San is effective for prevention and repair of circulatory shock, ischemic, and oxidative damage in the brain during heatstroke. The protective effects exerted by Sheng Mai San pretreatment were shown superior to those of Sheng Mai San post-treatment.^{xx} Administered orally, daily, and consecutively for 7 days before the initiation of heat stress, Sheng Mai San has been shown to significantly reduce heat stress-induced arterial hypotension and cerebral ischemia through inhibiting nitric oxide production and reducing formation of inflammatory cytokines in the peripheral blood stream.^{xxi} If the formula remedies the situation of the most extreme heat, in the form of heat stroke, it makes sense that it would help athletes prevent and recover more quickly from the (relatively) low-level damage that summer racing and training brings. And recovery is where the gains in fitness are made.

METAL

In the fall, in all but the sunniest of climates, the weather begins to decline. We go back indoors. We all know the seasonal associations with Metal, Lung, and sadness or grief. Maybe this helps explain them. It is emphasized more and more that, in order to continue for a period of years in the sport of triathlon, the athlete must schedule annual,

conscious recovery time. Following a season of racing, it is commonly recommended that the athlete focus on some extra rest and relaxation, cutting back on swimming, biking, and, to a lesser degree, running. In a TCM context, this means returning balance to a system that has been pushed in one physiological direction for months and months. The Californian acupuncturist Joe Bright suggests that endurance athletes feel good as long as they keep exercising. Exercise moves the Qi and Blood, preventing stasis, but breaking away from training, because of injury, or because of this annual rest period, allows deficient qi and blood to stagnate like water in a low-running stream. The multisport lifestyle often requires constant scheduling, planning, and organizing to make the most efficient use of time. When the athlete comes to this time of year, there may be other areas of life that have been pushed aside a little to squeeze in swims, bikes, runs, or more time in the gym. And this will keep us busy, but by this point, the body has adapted to a very high level of physical activity, and less can be a letdown. Auricular acupuncture is a nice fit, helping the athlete recalibrate his or her system as it adjusts to “down time.” Considering the notion that there is stagnation, treatment should also focus on moving qi and blood, in addition to tonification.

Most people are familiar with the concept of catching a cold after coming through a period of prolonged or intense stress. Riding on the adrenaline and pushing through a period of increased demand puts the body in a state where the sympathetic nervous system is more dominant than the parasympathetic.^{xxii} There are subsequent shifts in the functioning of the immune system to keep the active animal from getting sick while it hunts food. But when the food is caught or rest comes, the system moves more toward recovery and growth, and mounts against any superficial infection that it has been fighting along the way.

Many endurance athletes (cyclists, triathletes, runners) will carry a low level cold for months on end, which again shows that the overall picture is one of deficiency. The most common illness observed in athletes is a mild and self-limiting viral infection of the upper respiratory tract (URTI), ie the common cold. The symptoms of the common cold are well known and include mild headache, sore throat, nasal congestion, cough and mild fatigue. Viral URIs occur throughout the year although seasonal peaks are usually observed in the autumn and spring^{xxiii} Chinese medicine has focused on infectious disease since the time of the Shang Han Lun. URTI is a strength of Chinese medicine, with many developed strategies for cutting down the time that a person harbors pathogens, as well as reducing symptoms and sequelae, and most people don't know this, helping to explain the low number of clinic visits for treatment of acute infections. But in the case of the athlete, reduced quantity or quality of training means less fitness achieved. In Friel's Triathlete's Training Bible research is cited to show that with three weeks of not training, VO2 MAX decreases by ~8%, lactate threshold decreases by ~7% and time to fatigue decreases by ~10%, on average. This is another situation where, by getting the athlete back on his or her feet sooner, the TCM practitioner can help athletes immensely.

The discussion of respiratory infection brings mention of doping and banned substances. Competitive athletes are subject to World Anti-Doping Association (WADA) regulations. The Shang Han Lun introduced Ma Huang Tang (Ephedra Decoction) for treatment of acute stage Taiyang disease. Ma Huang has been in the Chinese herbal tradition for thousands of years, given in formulas with other herbs to balance and minimize any side-effects. Products containing ephedrine have been pulled

from drugstore shelves and removed from the conventional medical repertoire, but remains in the Chinese pharmacy because it has been shown to be used safely and effectively in our profession. Nevertheless, the Chinese herbalist must become familiar with the WADA banned substance list when treating the athlete population to avoid any charges of substance abuse. Bensky's *Materia Medica* supplies an excellent reference of chemical constituents that should be cross-referenced with the banned substance list before prescribing.

Doping has been identified in professional sports. Although the sport of triathlon has not shown a large occurrence of doping or doping convictions, compared to professional cycling or running, the cases continue to trickle in. One of the most commonly abused substances in professional athletics is human growth hormone (hGH). hGH provides has been shown to aid athletes in recovery and enhance substrate utilization.^{xxiv}

When prolonged, excessive training stresses are applied concurrent with inadequate recovery, performance decrements and chronic maladaptations occur. Known as the overtraining syndrome (OTS), this complex condition afflicts a large percentage of athletes at least once during their careers. OTS can be seen as a intensified version of the burnout phenomenon mentioned above. Persistent performance incompetence, persistent high fatigue ratings, altered mood state, increased rate of infections, and suppressed reproductive function have been described as key findings in overtraining syndrome^{xxv}. As stated above, of burnout, there is no objective biomarker for OTS and the underlying mechanism is unknown. However, it is recognised that OTS involves changes in brain structures, neurotransmitters, endocrine pathways and immune responses.^{xxvi} In addition to correlated feelings of inadequate social support, incompetence, and perceptions of diminished control^{xxvii}, hormone responses to exercise load have indicated decreased sympathoadrenal and/or adrenocortical activity (or exhaustion of the adrenal gland or the central nervous system) .^{xxviii} Clinical research results confirm a hypothalamo-pituitary dysregulation during overtraining through an impaired response of pituitary hormones to exhaustive short-endurance exercise.^{xxix} Simply stated, the hypothalamic-pituitary-adrenal axis (HPA) has been shown to be a common breaking point for the chronically over-extended athlete. Adrenal hormones decrease, but the damage can be traced all the way up to the pituitary gland. Professionals supplement the HPA with supraphysiologic doses of hGH to counter exercise-induced declines. Recognizing this, a physician to the Chinese Olympic team, Dr. Ruo Hong-Xiong has been conducting research on how to ameliorate the HPA declines. She found that ten days of supplementation with the formula *Fu Li Kang He Ji* (Return Abundant Strength Mixture, 复力康合剂), prevents declines in hGH that have been observed in endurance athletes. She found that the mixture not only prevented and treated declines in hGH, but also attenuated declines in testosterone and significantly extends the time to exhaustion.^{xxx}

Study of OTS brings to mind the pathologies of chronic fatigue syndrome (CFS) and fibromyalgia (FM). Many of the symptoms overlap clinically- fatigue, malaise, mood, appetite, and sleep disturbances to name a few. CFS and FM also share the same lack of a consistent biochemical marker for diagnosis. One criteria for diagnosis of CFS or FM is tenderness upon palpation at specific areas on the body. Triggerpoint charts available for athletes and coaches to find early signs of injury show a remarkably similar distribution to those used to diagnose CFS and FM. This finding can also be seen as

support for the channel palpation methods discussed above, and used to treat early. Another similarity are the comparable declines in the HPA axis.^{xxxi}

In OTS we see irregularities in heart function and aberrations in brain structure and function, negative assessments of social support, and correlations with sense of competence, and perceptions of control. We see hormone insufficiency in terms of CRH from hypothalamus, cortisol and catecholamines from the adrenals (often related to the Kidney), GHRH from the hypothalamus and GH from the pituitary. This is an insufficiency at the HPA axis. Viewed in terms of Chinese medical theory one may surmise a pathology between upper and lower. When we see consider the heart rate, we must consider Heart. When we consider deficiencies of adrenal hormones we must consider Kidney. When we see questions of social support we must consider *xin* (心), Heart/heart/ mind and *Shen* (神). When we see the athlete questioning their competence and control, we must look to *Zhi* (志), will, associated with Kidney. Together, *shen zhi* (神志) can be translated as spirit mind or the conscious mind. Yuan qi and Jing lie at Kidney. And so we see diminished function (用), due to an insufficient supply of Jing. The MIND-BODY link is more than just mysticism. In the study of athletic performance enhancement with traditional medicine, we see that it is a viable avenue that was paved by ancient physicians and may supply a novel approach to modern sports medicine.

ⁱ The Beginning of Western Science, David C. Linberg, 1992 University of Chicago Press pp124-30

ⁱⁱ <http://www.answers.com/topic/triathlon>

ⁱⁱⁱ <http://www.usatriathlon.org/sitecore/content/Secondary/AboutUSAT/Demographics.aspx>

^{iv} <http://www.usatriathlon.org/sitecore/content/Secondary/AboutUSAT/Demographics.aspx>

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