

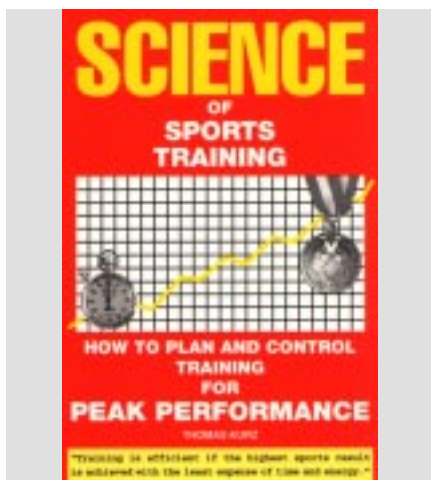


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New, Completely Revised and Expanded (150 more pages!) *Science of Sports Training* Is Here!



The second edition of *Science of Sports Training* is available now.

The goal of Thomas Kurz, the author of this book, is to give you the know-how for efficient training so you can achieve the highest sports result with the least expense of time and energy.

Now you can use the sports training savvy of Eastern European and other internationally known training specialists to improve your speed, strength, power, endurance, coordination, and flexibility, as well as your technical and tactical skills,

while avoiding overtraining and injuries.

This book shows how to prepare young athletes for successful and long lasting athletic careers and how to help the older ones, those who think they are past their prime, to reach new heights, maintain a high level of condition and skills and, by using efficient training methods, save their valuable time.

The second edition of *Science of Sports Training*, greatly expanded and updated, is already well received by the sports world. Here is what well-known conditioning coach Vern Gambetta wrote:

"The second edition of the book is outstanding. The changes add a lot to the book. I feel it is the definitive book in the field because it is a good blend of the theoretical and practical. It is something that the coach can easily use. I recommend it over all the others. Your book reflects the reality of training an athlete."

—Vern Gambetta, former conditioning consultant for the US Men's 1998 World Cup Soccer team, conditioning coach for the Tampa Bay Mutiny Major League Soccer team (1996-1997), Director of Conditioning for the Chicago White Sox organization (1987-1996)

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Injuries in Sports

Something is not right in sports when injuries are common even among world-class athletes trained by the supposedly best coaches. At any contest, in any sport, there are athletes who enter already injured or suffer preventable injuries while competing.

Just at the recent U.S. Figure Skating Championships, prior to entering the contest, top contenders had the following injuries:

Michelle Kwan—sore back; Sasha Cohen—stress fracture of a vertebra; Michael Weiss—back pain and a stress fracture of the left ankle; Timothy Goebel—strained knee.

Top athletes enter competitions having back pain and stress fractures?! These injuries are typically caused by lack of strength training or by poorly designed

strength training—inadequate for the magnitude and type of loads the athlete is subjected to in the sport, progressing at a rate unsuitable for a given athlete, and perhaps even creating muscular imbalances.

Such overuse injuries can be prevented by rational strength training—the subject that occupies a substantial part of *Science of Sports Training*.

Carnitine

by [Piotr Drabik](#)

Carnitine is one of the most basic and popular supplements, used by both athletes and nonathletes alike.

Without carnitine the human organism would not be able to use fats as an energy source. Carnitine is an essential cofactor for the transfer of long-chain fatty acids across the inner mitochondrial membrane.* It is necessary for proper function of the heart, skeletal muscles, and other tissues and organs.

Fatty acids are degraded by the sequential removal of two-carbon units via oxidation, which takes place in the matrix of mitochondria.

Carnitine also improves the immune system function. It is well documented that carnitine enhances lymphocyte proliferation, increases the rate of cytokines synthesis. *In vitro* pre-incubation of human leukocytes with carnitine enhanced phagocytosis, activating the membrane of natural killer cells (NK cells) and increasing the response of T lymphocytes to phytohemagglutinin (an antibody).

Carnitine occurs naturally and is classified as a vitamin-like substance. Carnitine is synthesized in the liver and kidneys from the amino acids lysine and methionine in the presence of vitamins C, B₆, PP (niacin), and iron. The natural dietary source of carnitine is mainly meat (the Latin root *carn-* means "meat" or "flesh"). Plants generally have only trace quantities of carnitine, with the exception of avocados.

An adult individual of 70 kg (155 lbs.) weight contains about 20 g (0.6 oz.) of

L-carnitine (L-carnitine is the biologically active form of the molecule, as opposed to nonbiologically active D-carnitine), which is mainly stored in skeletal muscles and the heart (98 %), liver and kidneys (1.5%). The remaining 0.5% is in other organs. To guarantee the proper level of carnitine in a sedentary individual, it is sufficient to take about 50 mg of carnitine in the everyday diet. Examples of sources of 50 mg of creatine: 78 grams of beef, 23 grams of mutton (mutton is the richest source of L-Carnitine, to compare: the same weight of lamb meat has about one third of the amount of carnitine, while chicken has about one thirtieth. Together with the carnitine one's body makes (about 1 g daily), these quantities enable the basic functioning of a person.

Requirements for carnitine are increased (over above-mentioned quantities) in long-term exercises, where carnitine helps the saving of glycogen and amino acids. Keeping a sufficiently high level of carnitine in the human body enhances the participation of free fatty acids in energetic processes, saving other substrates (carbohydrate and protein). Carnitine also improves resistance to fatigue and stress, and accelerates post-exercise biological regeneration. Carnitine allows for longer and more efficient physical work, increases fitness and resistance to fatigue. A deficiency of carnitine impairs the oxidation of long-chain fatty acids.

The best effects are obtained by taking large doses of carnitine (900-1200 mg) 4

hours before competition or exercise. This recommendation is for both athletes and those exercising recreationally. (See your physician before embarking on this regimen!) It should be kept in mind that carnitine changes lipid metabolism also in the aspect of reducing cholesterol level. Thus, the carnitine may be an effective prophylactic or curing-enhancing factor in such illnesses as hypercholesterolemia or coronary heart disease.

Unfortunately, lifestyle, degradation of environment, and improper diet, lead to a decrease of carnitine levels in individuals. Most people exist with permanent deficiency of this substance, which may lead to enhancing symptoms of other illnesses (like obesity, dementia, arteriosclerosis, diabetes, neuropathies, and myopathies).

Let us know what you think about our newsletter. Have you learned something that improved your or your athletes' performance or health? What would you like to learn more about?

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* Mitochondria are oval cellular organelles, typically about 2 μm (one millionth of a meter) in length and 0.5 μm in diameter. They contain the respiratory assembly, the enzymes of the citric acid cycle, and the enzymes of fatty acid oxidation. Mitochondria have two membrane systems: the outer membrane and an extensive, highly folded inner membrane. Hence, there are two compartments in mitochondria: the intermembrane space between the outer and inner membranes, and the matrix, which is bounded by the inner membrane. Oxidative phosphorylation takes place in the inner mitochondrial membrane itself, in contrast with most of the reactions of the citric acid cycle and fatty acid oxidation, which occur in the matrix. The outer membrane is quite permeable to most small molecules and ions because it contains many copies of porin, a transmembrane protein with a large pore. In contrast, the inner membrane is intrinsically impermeable to nearly all ions and polar molecules (like carnitine). Specific protein carriers transport molecules such as long-chain fatty acids across the inner mitochondrial membrane.

Carnitine carries long-chain fatty acids activated by CoA (coenzyme A) into the mitochondrial matrix. Fatty acids are activated on the outer mitochondrial membrane. Long-chain acyl CoA molecules do not readily traverse the inner mitochondrial membrane, and so a special transport mechanism is needed. Activated long-chain fatty acids are carried across the inner mitochondrial membrane by carnitine. The acyl group is transferred from the sulfur atom of CoA to the hydroxyl group of carnitine to form acylcarnitine. This reaction is catalyzed by carnitine acyltransferase I, which is located on the cytosolic face (facing the intermembrane space) of the inner mitochondrial membrane. Acylcarnitine is then shuttled across the inner mitochondrial membrane by a translocase. The acyl group is transferred back to CoA on the matrix side of the membrane. This reaction, which is catalyzed by carnitine acyltransferase II, is thermodynamically feasible because the O-acyl link in carnitine has a high group-transfer potential. Finally, carnitine is returned to the cytosolic side by the translocase, in exchange for an incoming acylcarnitine.

Individualization of Sports Training

excerpts from *Science of Sports Training* (second edition) by Thomas Kurz

The following excerpts from the updated and expanded *Science of Sports Training* present some of the factors necessitating individualization of sports training.

Somatic type (body structure). The size and proportions of the body determine what sports one can succeed at, and what techniques and tactics one should employ. The length of an arm outstretched forward with a clenched fist decides the choice of tactics most suiting a boxer. In basketball, not body height, but the total height of reach (how high the player can reach with his or her arms) is a decisive factor. The amount of turnout in a hip joint, shoulder and lumbar mobility, and height projected on the basis of the parents' height, are used in selecting children for gymnastics. The strength and flexibility of legs and the amount of turnout in a hip joint determines in what types of throws (hand throws, hip throws, leg throws) an athlete will specialize in judo and sambo wrestling.

The greater the variety of techniques and tactics in a given sport, the greater is the variety of body types (somatotypes) and sizes among successful athletes. The fewer the ways a victory can be achieved, the less differences there are among the athletes' body build. And so there are more differences among the world's best fencers

than among the world's best sprinters.

Type of personality. Some athletes prefer to play in attack, some in defense. Some need a strict tactical plan, others do best if they can improvise. Individual preferences should be observed in choosing types of techniques and tactics most suitable for athletes and, in team sports, assigning athletes to their positions.

While an athlete's temperament (one of the inborn features of personality) does not determine the outcome of competition, it determines the athlete's choice of techniques and tactics. Athletes of different temperaments may achieve the same results but by using the different techniques and tactics that are well suited to each one's temperament.

Another feature of personality—introversion or extroversion—determines teaching methods, the frequency of breaks during practice (less breaks for introverts, more for extroverts), speed of learning, frequency of workouts (greater for extroverts), and the force of stimulation (less for introverts, more for extroverts).

Extroverts need a lively pace of exercises, frequent changes in the form of exercises, speed, rhythm, and difficulty, and frequent breaks because after a short break the quality of an extrovert's performance improves. They like to exercise in a large

group and like teamwork. They prefer synthetic or holistic methods of learning skills. They respond well to decisive commands, and when at fault, to reprimands. When they compete, they respond well to cheering (Czajkowski 1996).

Introverts need a slower pace of exercises. They ought to repeat a given exercise for a long time, precisely, without changing it often, and with few breaks. They learn best with analytic or mixed analytic-synthetic methods. They benefit from exercising alone or one-on-one with the instructor. Explanation and gentle persuasion work best for introverts. Before and between performances, introverts need to concentrate alone, and do not respond well to rousing appeals to win at all costs (Czajkowski 1996).

Intelligence. The ability to learn technical and tactical skills depends on an athlete's intellect. The technical and tactical skills of the athlete depend on his or her capacity to learn new movements and modify known ones, and his or her capacity for rational thinking, concentration, and divisibility of attention.

References are listed in *Science of Sports Training: How to Plan and Control Training for Peak Performance* (Kurz 2001).

Self-Defense Tip

This self-defense tip deals with individualization of instruction. An educated instructor (with university-level training in physical education and sports training) will know which games and drills are age-appropriate for the group, how to individualize loads for individual members of a group during the workout, and how to vary instruction to match personality traits of individuals in the group.

Introverts prefer defense—they let their opponents have the initiative and are content to react. If their perception and analysis of the situation are accurate, they can very economically and efficiently dispatch their opponents.

Successful defensive fighters are intelligent (they quickly analyze all information on the situation), calm, adjustable, cold, and calculating.

Example of defensive fighting*: Staying just out of range, frustrating the opponent's attacks, until the opponent gets tired, upset, and careless. When the opponent is worn out, open to attack, and unable to counter effectively, the defensive fighter safely attacks.

Extroverts prefer attack—they seize the initiative and force their opponents to react. They are confident and optimistic—they are unfazed by their unsuccessful attacks and keep on attacking. Extro-

verts can also counterattack effectively but do not feel good about fighting defensively—they do not like to wait and leave initiative to the opponent.

Neurotics also attack but they do so out of desperation, do not analyze situations, and act chaotically. They attack but they are not in control of their actions. Except for the instances when they attack or defend chaotically they avoid contact with opponents by extending distance.

Successful attacking fighters are persevering, decisive, and obstinate; they like to take risks and to experiment.

Example of attack fighting: Launching a continuous series of attacks to force an opening in the opponent's defense.

Successful counterattacking fighters are confident, intelligent (they quickly analyze the situation and accurately anticipate an opponent's actions), dominating (not submitting to the other's initiative), calm, patient, and independent (not concerned with others' opinion, doing what is necessary to win without trying to impress anyone).

Example of counterattack fighting: Intercepting an opponent's attacks by evading, deflecting, or blocking and immediately attacking the openings that present themselves. Some counterfighters de-

liberately open themselves to an expected attack because they have a counter for it ready. Another way of setting up a counterattack is to attack to elicit an expected defense or a counter from the opponent and then to counter that defense or counter.

Understanding why some individuals prefer defense and others counterattack or attack helps to fit instruction and training to personality. Different remedies are needed for improving the tactics of a neurotic, who attacks desperately, than of an extrovert, who attacks confidently.

Instruction should accentuate the strengths and preferences of fighters and on the basis of these eventually diversify their styles of fighting. Instructors who impose one style of fighting on fighters with different characteristics, and have them do the same tactical drills, should be avoided.

* **NOTE:** In sports the counterattacking and the defensive styles of fighting are harder to distinguish in grappling than in boxing or fencing because of the close contact, which does not permit much sidestepping, and rules that penalize breaking or preventing contact and staying at a long distance. Outside of the sports setting though, grapplers can do as they please, avoid the grip, and stay at any distance.

Q and A on STRETCHING and TRAINING (continued from previous issue)

Study these typical questions on stretching and training carefully. You may find information that relates to questions of yours. Questions are in *italic boldface*.

■ *Sometimes when I lean my body to one leg or to both legs, either on the floor on on my feet, I get a terribly painful abdominal muscles' cramp. The cramp lasts for about ten minutes before I can resume normal activity. Mostly, the cramp happens to the left side when leaning the body toward my left leg. This has been happening for some three years now. I have been taking some magnesium supplement tablets as I have heard that magnesium helps prevent muscle cramps. I am not sure that magnesium has prevented more cramps from occurring. Any advice?*

Muscle cramps may be caused by insufficient levels of magnesium, or iron, as well as vitamins E or B₆. Another possible cause of cramps that occur during exercise is exercising strenuously one of the muscle groups that move a given body part while neglecting others—for example, doing only abdomen crunches and sit-ups but no back extensions or deadlifts with comparable muscle tensions. If this is the cause of your cramps, then the remedy for this is to add back extensions and deadlifts to your training. One-sided training is bound to cause muscle imbalance or overuse injury or both.

For an exact determination of whether your cramps are caused by a neuromuscular problem or by nutritional deficiency and the best means of correcting it, I recommend seeing a physician specializing in Applied Kinesiology. You can find such a specialist near you at <http://www.icakusa.com/directory/>.

■ *I joined taekwondo at the age of 31. At the rank of red belt I started teaching the kid's class once a week. I was practicing the flying spin side kick. I was used to hitting the bag with it, but this time I was performing it in the air. I twisted wrong and blew a disc. I went through the therapy first and it didn't help so I resorted to the surgery. After this surgery I was still*

in a lot of pain so I went under the knife again to operate on the disc between lumbar vertebrae 4 and 5. Now I have extreme pain from my low back to my hips, and down the rear and back of my right leg. Is there any kind of stretching or other exercises, anything at all that I should be doing? I don't want to have to live the rest of my life on morphine!

Some training errors result in catastrophic injuries and this may be one of them. Your errors—of not progressively learning to do this technique in this manner (without hitting the bag) in previous workouts and of doing a very dynamic technique without gradually warming up for it by performing easier and less dynamic versions of it—are violations of principles of rational training expounded in *Science of Sports Training*. I wonder, if in addition to these two errors, you have also neglected to strengthen your back prior to learning kicks and so violated the principle of building up first the strength of the muscles that stabilize the body before strengthening the muscles that are the prime movers in your sport.

I do not give medical advice beyond advising to see a specialist. In my opinion injuries, both chronic and sudden, are most effectively treated by physicians specializing in Applied Kinesiology. These physicians know how to find out what prevents an injury from healing and how to restore the function of all systems involved in an injury (nerves, muscles, and joints). See my answer to a previous question for information on how to locate such a physician. If you have a choice, go to those doctors who are Diplomates of the International College of Applied Kinesiology and have initials DIBAK after their names.

NOTE: This person, without knowledge of training and teaching, was put in charge of a children's class. In conscientiously run sports programs children are trained by the best instructors. This is for their safety and to instill the best habits. In contrast, in programs run by lazy or greedy martial artists it is their students, aspiring black belts who know nothing of rational training, who are relegated to teaching children.

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