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## New Book from Stadion: *Explosive Power and Jumping Ability for All Sports*

It is difficult to find a sports discipline that does not call on explosive strength (which in many sports manifests itself as jumping ability). But—to quote the authors of *Explosive Power and Jumping Ability for All Sports*—“Theoreticians have counted on the hope that some peculiar combination of training in two fundamental abilities [strength and speed] will give the sought-after capability—namely, explosive strength. At the same time practitioners—coaches—have worked out several original training solutions, effectively developing sport-specific forms of explosive strength or jumping ability.”

*Explosive Power and Jumping Ability for All Sports* gathers these experiences and systematizes existing knowledge about training for explosive strength. The book shows sport-specific progressions of plyometric exercises. Each progression is designed specifically for one of 32 major sports and martial arts, starting with badminton and ending with wrestling.

You will learn from this book all there is to know about developing explosive strength and jumping ability. Everything is covered: how to prepare for intensive plyometric exercises, typical loads in a workout and in a yearly training cycle, and injury prevention.

How well you jump depends on your

explosive strength, on your special endurance for jumping, and your speed, coordination, and flexibility. This book tells you how to develop each of these abilities.

The authors of *Explosive Power* are world-recognized experts on sports training. Tadeusz Starzynski is an outstanding coach, and a world authority on training for jumps. Athletes coached by him have won two Olympic gold medals, two gold medals at European Championships, and several times won national championships and set national records. A member of the World and European Federation of Track and Field Coaches, he is the author of more than 150 publications published in 30 countries.

Henryk Sozanski, Ph.D., coached several international-class track-and-field athletes. He is a professor and a president of AWF (University School of Physical Education) in Warsaw. He specializes in problems of training—including the role of jumping ability in athletes’ fitness preparation. He has directed research on training loads and their optimization and is the author of more than 300 works concerning the theory of sports training.

This book will be useful for coaches, instructors, teachers, and athletes at all levels of experience. Stadion Publishing expects it to come off the press in the spring of 1999.

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## Flexibility and Strength

We thank Mr. David Jurkowski for sending us his photo showing the results of using our stretching method. Here is what he wrote:

“I read [*Stretching Scientifically*] back in 1989. It took me about eight months before I could do the full splits between chairs. I’ve been practicing stretching since then. It has helped me with my body-

building as well as my martial arts training through the years. Over the years, I have recommended your book to several friends.

“Thank you. Your stretching method is the most efficient I have ever seen.”

—David Jurkowski, Fort Walton Beach, Florida.



## Sports Skills and Strength Training III

by Thomas Kurz

In this installment on how strength training relates to sports skills, I will continue with jumping ability, which is a manifestation of explosive strength in the form of a jump. Other manifestations of explosive strength are martial arts kicks and punches, or the action of the arm in shot put.

The greater the force you can apply in the short time of contact with the ground (jump takeoff), or in the time it takes to throw your martial arts kick or punch, the greater is your explosive strength. The height of your jump depends on how much force you can apply in the short instance of a takeoff. How far your opponent will fly across the ring depends on how much force you transfer to his or her body in the instant your fist or foot contacts it.

The principles of training for jumping ability (but not the particular exercises), also apply to any explosive strength training.

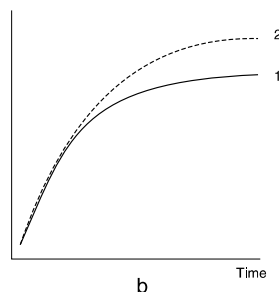
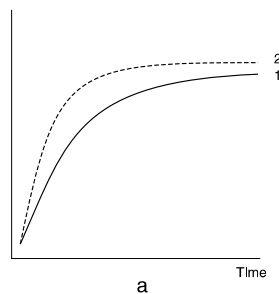
Explosive strength is developed by overcoming resistance in very fast movements, such as by doing very fast squats, throwing medicine balls, jerking dumbbells and barbells, and jumping. But your first task may be an increase in your maximal strength by standard resistance exercises. Decide by answering this question: Is your maximal strength much lower than that of leading athletes who display adequate explosive strength in your sport and in your weight class? If yes, then you may have to first increase your maximal strength.

Zatsiorski (1995), with the example of a beginner shot-putter, explains why someone lagging in maximal strength may increase explosive strength by increasing maximal strength. The delivery phase in shot put lasts from 0.15 to 0.18 seconds, and the best shot-putters (with results of 21.0 m, or 69 ft.) within that short time apply a force of up to 60 kg, or 132 lbs. The best shot-putters bench-press from 220 to 240 kg, or 480 to 530 lbs., which gives 110 to 120 kg, or 240 to 265 lbs., per arm, so you see that in the very brief time available they can use only about 50% of their maximal strength.

According to Zatsiorski a beginning male shot-putter who bench-presses only 50 kg, or 110 lbs., may improve shot put

performance when he bench-presses 150 kg, or 330 lbs. Improvements of maximal strength up to that point may increase the amount of force the athlete can mobilize within the time span of 0.15-0.18 of a second. (The underlying reason is that the strength-time curves depicting the strength increase for different amounts of resistance are identical for the same athlete, so the initial buildup of maximal strength increases force available at progressively longer time intervals—in the case of shot put, up until 0.18 of a second. See *Stadion News Summer 1998* for explanation and drawings of such curves.) Eventually an athlete's maximal strength increases so much that all the curve increase happens later than the time available for action. Further increases of maximal strength probably will bring no improvements in shot put. From that point on, the key to improvement lies in shifting the curve by explosive strength exercises, including plyometrics.

In plyometric exercises muscles are rapidly stretched right before contracting. Examples of plyometrics are jumping drills, depth jumps, clap push-ups, and catching and immediately throwing back a medicine ball.



How strength improves as a result of (a) plyometric, and (b) concentric, or standard strength exercises (Platonov 1997)

Now, on with developing explosive strength for jumps or jumping ability.

If you don't jump as high or as quickly as you need, even if you can squat with a heavy weight (150-200% of body weight), you should consider adding exercises for explosive strength to your workouts. To tell what exercises you need to focus on, ask yourself if the height of your reach jump from standing still is less than that of athletes in your sport, who jump well and who squat the same as you. Ask yourself how your takeoff for your typical jumps feels. Is it instantaneous and explosive, or is it sluggish? (A very poor result would be 21.6" [55 cm] for men and 16.9" [43 cm] for women.)

Poor results in a reach jump done from standing still indicate low explosive strength, especially if your maximal strength in a squat (as measured by maximal weight lifted) is high. Short sets of squats and half-squats performed very fast develop the explosive strength of your legs.

If you have good results in a reach jump done from standing still, but exhibit a long support phase during takeoff in your sports technique, this calls for plyometrics. Plyometrics shorten the time of switching from an eccentric muscle action (a landing or a stomp preceding a takeoff) to a concentric action of the takeoff itself. As the article in *Stadion News Summer 1998* explained, jumps preceded by a short step or a jump (landing and immediately jumping again) require and perfect reactive strength and starting strength. Practicing jumps from standing still does not require reactive strength—the ability to mobilize one's strength very quickly. Neither does it put as short a time limit on the takeoff as the jump "from a landing," and so it does not improve the ability to mobilize one's strength very quickly (Wazny 1981). Practicing jumps "from a landing" increase the height of a jump from standing much more than the other way around.

Both jumps and very fast squats and half-squats develop explosive strength and both types of exercises should be used in training for jumping. Fast squats and half-

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## Sports Skills and Strength Training III

(continued from page 2)

squats are less intensive efforts and put less stress on the body than full force jumps and depth jumps, however, and therefore should constitute the bulk of your work on developing explosive strength. (Except when your explosive strength as measured by the reach jump is fine but the takeoffs are too long.) Even though your initial progress is faster, a more intensive exercise leads sooner to plateauing or possible regress caused by overwork or injury. One of the causes of plateauing is repeating an exercise numerous times with maximal speed, which results in "learning" to move with that speed such that eventually you cannot exceed it even though your physical potential may increase thanks to other exercises. The more intense the stimuli, the quicker the learning—that's the principle. This is one of the reasons it is preferable to derive as much benefit as possible from less intensive exercises and use the most intensive ones for the "final touch."

Children should develop strength with jumps, throws, and body weight exercises, and not with heavy external weights (Drabik 1996). This is not contradicting the principle in the preceding paragraph because children should do only low intensity jumps (from age 7, rope skipping; between 13-15, hopping in place and simple bounding according to Bompa [1996]).

Practice has shown that having reached

a certain magnitude of maximal strength is necessary for the safe use of plyometric exercises in explosive strength training. For your legs, you should have enough strength to do a squat with a barbell weighing at least 150% of your body weight (Baechle 1994). Platonov (1995, quoting Gambetta) states that, before undertaking single leg jumps, you should be able to do five squats on one leg, and before starting depth jumps followed by a jump up, you have to be able to do squats lifting at least 200% of your body weight. Before introducing plyometric exercises for your arms, you should be able to bench press from 100% to 150% of your body weight—athletes who weigh more than 115 kg, or 250 lbs., ought to lift 100% of their body weight and lighter athletes ought to lift more (Baechle 1994).

Introduce plyometrics into your training gradually. Start with such low intensity exercises as jumping rope, hops-in-place, and clap push-ups. Progress through more intensive bounds, jumps, and medicine ball catches to high intensity plyometric exercises, such as depth jumps, reactive jumps, and swinging suspended heavy weights with your arms.

Bompa (1996) states that it can take four years for young athletes to gradually arrive at being able to do high intensity plyometric exercises safely.

Progressions of plyometric exercises for 32 major sports and martial arts are shown in the forthcoming new book from Stadion Publishing, *Explosive Power and Jumping Ability for All Sports*, which will come off the press in the spring of 1999. In this book there are 156 plyometric exercises arranged in sequences specifically designed for each of these sports and 21 supplementary strength exercises to be used in preparation for plyometrics.

In the next issue you will learn about the methods of performing explosive strength exercises, and about the selection of plyometric exercises.

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### Self-Defense Tip by Thomas Kurz

This issue's tip deals with selecting a self-defense system or instructor.

In selecting a self-defense system, the foremost concern is with the validity of skills taught. In this article I use the term *skill* in the sense of art or trade and so here by a *self-defense skill* I mean the sum of your

- techniques,
- knowledge of when to use these techniques,
- anticipation and avoidance of dangerous situations,
- presence of mind while facing hostility, and
- ability to sense danger.

Self-defense skills must be based on realistic techniques and good physical conditioning—being in poor shape or having untrustworthy techniques makes it difficult to have presence of mind in a dangerous situation. Unrealistic training involving fantastic techniques that can't work against a determined attacker or are designed for situations you are unlikely to face will also fail to teach you how to anticipate danger.

In my opinion, sports-based full-contact systems are the most reliable source of valid self-defense skills for the general public. The need to act rationally while threatened by or experiencing light to moderate pain develops your presence of mind. Having realistic techniques practiced on yourself develops anticipation—your ability to detect setups. Physical conditioning delays fatigue so you clearly perceive the situation and react correctly. It also lets you withstand some blows.

I recommend choosing sports-based full-contact systems because the skills they teach must be functional, at least during a contest against a skilled and well-conditioned opponent. What instructors of boxing, kick-boxing, muay thai, full-contact karate, or Brazilian jiu-jitsu teach either works in the ring when money is at stake or the instructors lose their job. That said, you also have to realize that a boxing or a judo club can produce great competitive fighters without teaching techniques geared toward a no-holds-barred self-defense, including use of and defense against weapons and other objects and down-and-dirty tricks. In selecting a gym, you have

to ask specifically if self-defense skills are a significant part of training there.

What I strongly advise against is joining a non-contact or even a contact system that has a fancy Asian name but is headed by someone who is not from Asia.

There are effective systems designed either for combat or for self-defense that do not hold open sports contests. These systems are also full-contact (at least in the practice of the unarmed techniques). With few exceptions (for example, of Viet-Vo-Dao), these systems are not available to the general public because they are either military or police system, or they were designed and practiced by criminals. Some are modern, some are old. In any case the creators of these systems had extensive and bloody combat experience and, as a rule, named the systems (if they named them at all) in their own language. Being who they were (or are), they commanded respect—or else. They had no need to appear exotic or support themselves with someone else's authority.

*To be continued in the next issue*

## QandA on TRAINING and STRETCHING

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

■ **What is your opinion of lifting lighter weights but at a higher rate of speed to increase one's overall power?**

For developing sport-specific power, the velocity of movement has to be very close to that of the actual sports technique. The resistance (weight) must be such as to permit moving at that velocity.

■ **I am currently doing lying leg raises, leg curls, squats, dumbbell bench press, military press or dumbbell lateral raises, dumbbell bench rows or close grip lat pulls, good mornings, reverse crunch, crunch or sit-ups; is this a reasonable set of exercises to improve my martial arts abilities?**

These are general strength exercises—not specific for your activity so they will help you only if you are a beginner and in poor shape. This exercise program, consisting of general strength exercises, is perhaps strengthening your body and, inasmuch as your performance is limited by your weakness, can help it too. Eventually this program of exercises will stop bringing any improvements to your martial arts performance, even though your overall general strength will keep on increasing. Then, for further improvements in your sport-specific strength for martial arts you will need to add sport-specific strength exercises.

■ **I am 31 years old. I have been taking kenpo for about a month. My hamstrings are very tight. One of my problems is that I do not have free weights, but I do have a bowflex. Would I get adequate leg strength if I did leg presses and low back rows instead of squats and dead lifts?**

Maybe. Unlike leg presses and back rows, however, squats and deadlifts are natural movements that occur often in everyday life and in fighting. Many grappling throws include a squatlike movement, and during ground fighting, when standing and

lifting an opponent off the ground, one is doing a deadlift.

■ **I am in my thirties and have been extremely inflexible all my life. A few months ago, I began training to do the Olympic lifts (snatch and clean and jerk). I am so stiff that I can't receive the bar correctly in the clean. The main problem seems to be my inability to flex my hips fully while keeping my lower back extended. This prevents me from keeping my torso upright, and the bar falls forward off my shoulders. Two lesser but still significant problems are getting my elbows high enough; and flexing my ankles far enough in the low squat so as to remain balanced front to back without leaning forward. The net effect of these problems is that I simply can't do a correct clean. Can you suggest any exercises or warm-ups to help with these problems?**

**Oddly enough, my overall shoulder mobility is not bad. I have no problem holding an empty bar overhead in the snatch position while squatting. With light weights, I can simply arch my back enough and move my arms far enough behind me so that I can balance in a near-full squat while holding the bar overhead in a snatch grip. But my upper body leans forward so that I cannot support a bar on the front of my shoulders. I can't keep my torso upright at the low point in either lift.**

Your problems can be remedied by doing lots of deep and wide squats without a barbell and with a barbell in both front squat and back squat positions. For dynamic flexibility do these squats fast and for static flexibility do them slow but with heavier weights.

You might benefit from reading up on an analysis of the lifts. Some of the better books on this subject are available from IronMind (P.O. Box 1228, Nevada City, CA 95959, phone 530-265-6725).

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