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New DVD: *Acrobatics for Everybody*

We have released a follow-up DVD to our *Acrobatic Tumbling* DVD. This new DVD is titled *Acrobatics for Everybody: Acrobatic Workout for the General Public*.

The DVD shows a workout for the general public (not for acrobats!) conducted by expert instructors of acrobatics—coaches Dariusz Obrebski and Pawel Grzybczyk. Anyone can come to such a workout and for a small fee have the use of the gym and the coaches' help. Because of that, levels of ability displayed by students on the video are very uneven, which makes it interesting to watch how they learn, what errors they make, and how they are corrected.

The video was not recorded professionally—it was done with a handheld camcorder—but it's worth watching. You'll see more tips on learning popular tumbling techniques, such as somersaults (flips) and handsprings (flic flacs), as well as interesting exercises for warm-up and stretching. Also, you will see teaching sequences for the butterfly and for the wall flip.

You will see how average young people, not especially talented, from late teens to twenties or thirties, learn front and back somersaults, front and back handsprings, flying cartwheels, the butterfly, and the wall flip, quickly and with no fear.

On this DVD there is also a p.e. lesson showing how to teach a handstand. I decided to add this lesson to the DVD because the teaching method and exercises are different from those shown on the *Acrobatic Tumbling* DVD. Seeing them may give more ideas to instructors and students. The handstand is the prerequisite skill for learning tumbling moves such as cartwheel, roundoff, front handspring, and back handspring.

Who needs this new DVD?

This DVD is especially important for coaches and instructors as it shows how to run a tumbling workout for athletes who are not acrobats or gymnasts.

It is an after-hours workout for regular people who want to learn tumbling and other acrobatic skills. These are people who work or study full time, or do both—study and work. Some have been to such workouts for a few months, for others it was their first workout. Some of them come three times a week, some just once a week—whatever their work or study schedule permits.

I like this workout. To an ignorant observer, it looks as if after the warm-up no one is in charge. Actually, everything is under firm control of two instructors. Everybody gets as much help as they need, and no one is pushed to do skills beyond what they are ready for.

Instructors watching this workout will pick up some tricks of the trade, some ideas for use in their workouts. Athletes who want to learn tumbling will benefit too: Just watching others practice is a proven method of improving one's technique. During this workout, every technique is done by people of different build, ability, and experience, so the viewer can learn from their errors and how they are corrected. (To learn each of the basic tumbling techniques step by step, watch the DVD *Acrobatic Tumbling: From Rolls to Somersaults*.) There is an extra attraction shown during this workout: a full teaching sequence for the butterfly and for the back somersault off the wall.

Did you know?

Intelligent instructors of many sports, such as ball games, combat sports, martial arts,

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and track and field, teach tumbling in their training programs because it builds confidence, decisiveness, and coordination, of course. It is a great form of active rest and is just plain fun. Also, as good coaches of team sports know, tumbling practice builds team cohesion, because athletes work in groups, assisting each other in turns.

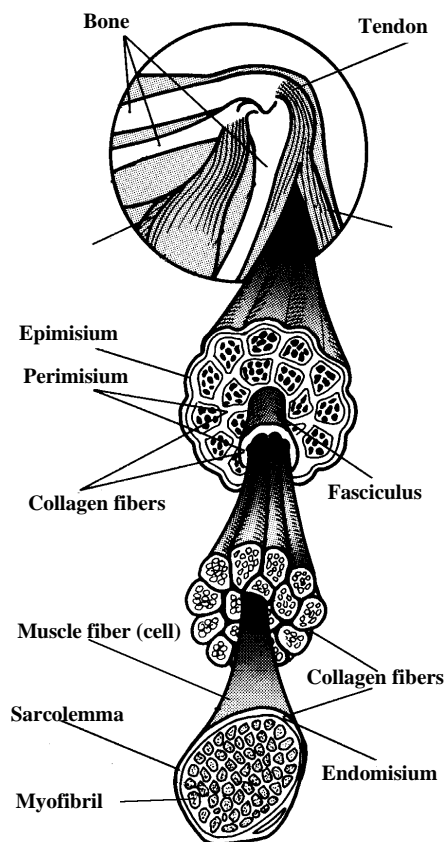


You can buy both the *Acrobatic Tumbling* DVD and *Acrobatics for Everybody* DVD in our *Acrobat's Bundle* for \$61.97 and save \$10.93! You will get free shipping too!

How to Strengthen Your Tendons

by Thomas Kurz

Tendons are not really separate from the muscles, so before I get to tendon strengthening, here are some facts about the muscle-tendon unit (MTU).



Muscle-tendon unit: collagen fibers and muscle fibers

Tendons and muscles are separated only by words and by blades—of a butcher, a cook, or a surgeon. A tendon is just a continuation of a muscle's fibrous connective tissue, and it transfers force from the contracting muscle to the bone. Functionally, a muscle and its tendon are one unit. That unit (muscle-tendon unit, or MTU) produces force by various combinations of the muscle fibers' contraction and a release of elastic energy from the MTU's connective tissue, chiefly from its tendon.

The MTU can produce force, for example, to lift a weight, by contracting muscle fibers so the whole MTU shortens and pulls on the bone of the arm that holds the

weight. The MTU can also bounce a weight by contracting muscle fibers to stiffen itself just prior to the contact, making the MTU work like a spring.

Ideally, for the most economical use of energy, during such bounce the belly of the muscle tenses isometrically—it doesn't shorten at the instance of contact—so the taut tendon stretches (stores energy) and then shortens (returns energy). Practically, upon impact the muscle tenses as it is stretched (eccentric action), then as the MTU shortens, the eccentric action changes into concentric action, so the return of elastic energy is combined with concentric muscle work.

Such a pattern of a stretch followed by a shortening is called a stretch-shorten cycle (SSC), and it happens in many movements—in running, jumping, bouncing, and throwing. It allows for the use of elastic energy stored in the MTU and combined with the muscle's stretch reflex.

It is much more efficient to increase power of movement by releasing elastic energy stored in a tendon kept taut by a contraction of its muscle fibers than to do it by a muscle contraction alone.

Elastic materials, such as springs or bungee cords, can be deformed or stretched with a force acting slowly (low-power action), storing energy by performing work ($F \times d$), but then recoil and return the stored energy quickly (high-power action). Unfortunately, MTUs do not work exactly like coil or leaf springs. For a MTU, the slightest delay between eccentric (stretch) and concentric (shorten) phases of SSC considerably reduces the return of elastic energy.

The stiffer (the less compliant) the MTU, the more energy it can store and release, but it takes greater force to stretch it than a more compliant one. And vice versa, the more compliant the MTU, the easier it is to stretch it, but at the same stretch it stores less energy than a stiffer one and returns it more slowly.

A stiff MTU requires more force to be stretched, but then it returns most of this force very rapidly, so it can generate required power ($F \times V$) from even a little stretch.

Training with heavy resistance (75%-90% of 1RM) increases stiffness of the loaded MTUs, while stretching (dynamic

or static) increases compliance of the MTUs. Keep in mind that compliance and stiffness here refer to mechanical properties of MTUs—that is, to the ratio of force to deformation (stress to strain)—and not to flexibility. So a MTU with high stiffness may be long and have a great range of motion; and vice versa, a MTU with low stiffness (high compliance) may be short and have a low range of motion—like a long rope (high stiffness) versus a short rubber band (high compliance).

Here is more on increasing stiffness of tendons, from *Stretching Scientifically*:

“The stiffer the tendons, the better use of elastic energy in stretch-shorten cycle movements, provided you have the required range of motion (Kubo et al. 1999). If your range of motion is less than that required for taking full advantage of the stretch-shorten cycle, then it may be beneficial for you to increase the range of motion at the cost of lowering the stiffness of involved muscles and tendons (Wilson et al. 1992). Doing dynamic resistance training together with static stretching gives the benefits of increased tendon stiffness and increased reuse of elastic energy in a stretch-shorten cycle, without changing or increasing the passive resistance to the stretch (Kubo et al. 2002a).

“Isometric strength training increases the stiffness of tendons and the longer the isometric contractions the greater the increase in stiffness (Kubo et al. 2001b; Kubo et al. 2001a).”

Plyometrics at a moderate volume (up to 100 impacts per workout) increase power output without increasing stiffness (*i.e.*, reducing compliance) of MTUs. Both plyometrics and stretching reduce the energy loss in a tendon that occurs between the stretch and the recoil.

Your Tendons and Your Strength

First, about the structure of tendons: A tendon near its attachment to the bone is stiff, while at its beginning near the muscle it should be compliant (*i.e.*, stretchy). The stiffness near the bone end is caused by the gradual transition from pure tendon fibers, then intermeshed with fibrocartilage, which then becomes mineralized fibrocartilage, which finally merges with bone.

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How to Strengthen Your Tendons

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This progression of gradually stiffer zones of composite material decreases stress concentration at the attachment of the tendon to the bone.

The compliance or stretchiness of the tendon near its junction with the muscle protects the muscle by slowing down transfer of force to muscle fibers. A tendon's compliance at the muscle end does not have the adverse effect it would have at the bone end, because it can be regulated by the muscle's tension. If there is a need to stiffen the whole muscle-tendon unit, the muscle can be tensed to take up nearly all of the tendon's slack, or less—depending on the need.

Healthy tendons get stronger with any resistance exercise that strengthens the muscle pulling on the tendon—if it is not overdone. And for most people this is enough. But in some cases athletes may want to put special emphasis on strengthening their tendons—to increase their tensile strength or make it grow faster. Why? Because of this rule:

For most people, a muscle's contractile strength is limited to 30% of the tensile strength of its tendon.

The most time- and effort-efficient method of strengthening tendons is to perform resistance exercises with a slow eccentric phase—so the weight, for example, is lifted at a normal velocity, but it is lowered more slowly.

If this way of doing the exercise is too hard, your muscles get tired quickly and then get sore; you need to begin with low resistance or no resistance, and just move at a comfortable velocity up and down. That is how adductor flies for strengthening tendons of the inner thighs are shown on the DVD *Secrets of Stretching*. Work your way up to 100 reps without any external resistance (no weight attached to your limb), and then begin to add weights in small increments. How small? As small as to let you do nearly 100 reps, so for some movements it may be less than half a pound or 0.25 kg.

Here is the progressive scale of both exercise difficulty and effectiveness for strengthening tendons and fibrous connective tissue within muscles:

1. Low resistance, high reps: movements at a slow-to-moderate velocity with stops at the beginning and at the end of each

movement. Such exercises improve capillarization and thus speed of recovery of the involved muscles as well as strength of the fibrous connective tissue of the whole muscle-tendon unit. It is easy to isolate given muscles with such movements.

2. Low resistance, high reps: movements at a slow-to-moderate velocity with a slow eccentric phase—so the body part, with or without weight, is lowered slower than it is lifted. This way of exercising is used in physical therapy to strengthen tendons weakened by inflammation (tendinitis or tendonitis [both spellings are correct]) and, in bad cases, affected by tendinosis or tendonosis [both spellings are correct]), which is a painful chronic condition in which the inflammation is no longer present but the tendon's fibers are misaligned and fragmented, which greatly reduces their strength. These exercises are to be done only after the inflammation is gone.

3. Fast movements with an abrupt switch from eccentric to concentric action (*i.e.*, plyometric exercises). This can be done with isolation movements as well as with complex movements such as hopping, skipping, running, leaping, box jumps, quick push-ups, and other plyometric exercises show in *Explosive Power and Jumping Ability for All Sports*. Plyometric exercises vary in the stress they put on muscles and tendons depending on the abruptness of that switch. At a high volume (more than 100 impacts per workout), they increase stiffness of the whole muscle-tendon unit, which is good for energy return while running or jumping or rebounding. Their downside is that they may increase stiffness of the tendon too much. A tendon too stiff transfers force to muscle fibers too quickly and so causes muscle strains. This downside of plyometrics can be remedied by doing exercises described in point 2 at least once a week. Those exercises decrease stiffness of the tendon at its muscle end.

How to tell your tendons are too stiff? When the customary training loads, which were easily tolerated, begin to cause muscle soreness.

Full bibliographical references for works quoted in this article are in the book *Stretching Scientifically*.

Q and A on Training

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

■ *I have a couple of questions regarding what type of iron boots Mr Kurz uses on his stretching video and also what type of sneakers he uses. I have a problem with the shoes that I use. They seem to slide when I do the side split stretch, and my feet bend in too much.*

I have been doing his video on and off for a while now, and I still can't touch my hand to my foot in the side leg raise. What other points can you give me on that matter?

I use whatever sneakers give me good traction. Boxing boots or shoes and wrestling shoes (such as those seen on the DVD *Secrets of Stretching*) are good.

On the side leg raises: Observe and do as I do on the DVD. Begin low. If this advice is not enough, perhaps the way I show it on the DVD *Clinic on Stretching and Kicking* will make it clearer for you. Actually, you can see the step-by-step teaching of the side raise in the free movie at stadium.com.

For iron boots, see this thread at Stadion's forum:

www.stadium.com/phpBB3/viewtopic.php?f=37&t=353

and others in the forum on Gear for Strength Training:

www.stadium.com/phpBB3/viewforum.php?f=37

Instead of iron boots you may use small kettlebells. They are easier to put on and take off (just stick your foot in the handle), so you don't waste time fastening the iron boots.

You can get reasonably priced kettlebells from Kettlebell Inc. (kettlebellinc.com) or from Perform Better (performbetter.com). Perform Better is located in Rhode Island, so their shipping is the least expensive in the Eastern U.S.A. They occasionally hold sales on their kettlebells and other equipment. Kettlebell Inc. is in Texas.

For those who do not know what exercises with iron boots have to do with splits and stretching: They prepare muscles and tendons of the inner thigh for the most time- and effort-efficient method of stretching for the splits. Without this preparation, the very

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Q and A on TRAINING

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effective isometric stretches can cause muscle soreness and keep you from stretching and doing other exercises. The exercises with iron boots (or other weights) strengthen the muscles' tendons and the connective tissue within the muscles themselves so they become resistant to soreness or to strain. Doing these exercises is a major factor in protecting yourself against groin pulls, hamstring pulls, etc. Just progress gradually, as explained on the DVD *Secrets of Stretching*, to avoid muscle soreness. Thanks to such exercises I, and those who follow my instruction, can do hanging splits without getting sore. (Muscle soreness is caused by damage to the muscle fibers and the connective tissue surrounding them. If you keep on exercising sore muscles, they might atrophy or even tear.)

■ *I'm Igor Kurinnoy's North American representative and editor for his Sambo for Professionals series. I'm currently editing the third in the series, Physical Preparation for the Fighter/Wrestler.*

Igor feels very strongly about the value of acrobatics for judoka and sambo wrestlers. He feels they are vital to help with a number of throws.

I am going to order your DVD Acrobatic Tumbling: From Rolls to Somersaults for my children's class. My question, however, concerns me. I am 50 and I have been involved with judo and sambo for 36 years.

I can do cartwheels, backward somersault to handspring, etc. What I cannot do are backward flips, back arches, flick flacs, etc., which are important for back throws. Can your DVD help me (at age 50)?

I guess that by "backward somersault" you mean a backward roll—otherwise your question does not make sense because in the standard gymnastic nomenclature a backward somersault means the same as a back flip. I also guess that by "back arches" you mean back bridges. Back bridges help with the soupless (the backward-bending throw) used in many

kinds of wrestling (e.g., freestyle, Greco-Roman, sambo), but in judo one can do *Ura-nage*—the judo throw similar to the soupless throw—very well without having a good back bridge.

Being involved with judo for so many years, you must know why the standard form of *Ura-nage* does not require much back bending. If it did, it would not make it into *Gokyo-no-Waza* and *Nage-no-Kata*. It simply would not meet the criteria for being included in those forms.

By the way... none of the acrobatic or gymnastic techniques shown on the *Acrobatic Tumbling* DVD requires being able to do the back bridge. On this DVD there is only one technique that requires doing the back bridge—the breakdancers' back handspring—and that technique does not belong to acrobatic or gymnastic tumbling techniques.

In any case, there is no skill transfer from acrobatic or gymnastic techniques such as back handspring (flic flac) or backward somersault (back flip) to any throwing techniques, of any kind of wrestling.

Somersaults (flips) may help with defeating some throws or locks but not with applying them. So, the DVD should help you with learning back tumbling skills (being 50 is not an obstacle), but the tumbling skills will do next to nothing for your back throws.

■ *I dislocated my right kneecap just a few days ago, something which hasn't happened in many years. The injury seems to be healing well, but it's got me worried and looking for ways to stabilize my knees. Stretching Scientifically refers to knee-stabilizing exercises but does not go into any detail. Where can I find more information?*

For stabilizing the knees, I use various forms of squats and good mornings. More detailed information on training progression and on particular lifts is found in articles of my [column](#), starting with article number 18. To specifically stabilize the kneecaps, follow the advice and do the exercises shown at www.stadion.com/injuries.html.

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