Timed Static Contraction

by Ken Hutchins

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In the past I have said scant little regarding isometrics as a viable form of exercise. I am told that isometrics got some attention during the 1950s due to some research performed at the *Max Plank Institute.* Their results were so good as to be unbelievable. When asked to repeat their work, the results were not replicable by the Germans or anyone else.

Over the past several years I have sometimes stated my doubts regarding the value of isometrics as they were originally performed: a maximum pull or push that lasted 10-15 seconds. Blood pressure problems were a major concern, especially in contraction positions requiring a grip. And the inroad/stimulation of such a brief contraction was minimal.

I have often declared that the only time such a protocol was valuable or safe is at its eventual and unavoidable onset at the end of each isotonic set. When you fail during a regular isotonic exercise, you have already achieved enough inroading to make the isometric contraction safe. Also, you will achieve additional and meaningful inroading at the end of the set. Arthur Jones alluded to this in his early writings. I remember Arthur writing something to the effect that, "during the last all-out [isotonic] repetition you should be moving as fast as possible, which in reality will be no movement at all."

In general, I still adhere to this philosophy, including the attitude that traditional isometrics are of little value; however, a different protocol of isometrics does have a legitimate place within the *SuperSlow Exercise Philosophy.*

Three or four years ago, Stephen Maxwell alerted me to the writings about static contractions by John Little, editor of *Flex* magazine. He explained a protocol—Timed Static Contractions (TSC)—whereby an isometric effort is applied for a continuous duration of two minutes. This duration is divided into four 30-second quarters.

The first quarter is applied with an—albeit subjective—25% effort. I sometimes refer to this as a "minimal effort."

The second quarter is applied with a 50% effort, sometimes referred to as a "moderate effort." This effort is roughly the same effort as that which a subject usually exerts for the typical first repetition of a dynamic *SuperSlow Exercise Protocol* repetition.

The third quarter is applied with a 75% effort, also termed "almost as hard as possible."

The fourth quarter is applied with a 100% effort.

Steve emphasized that these static contractions were very useful for subjects with special problems such as poor motor control or injuries.

At that time, I mentioned these enlightenments to Ellington Darden, PhD. He remarked that, "Ken, if you think it is difficult to get body builders to do SuperSlow, how seriously do you expect them to consider doing one-minute static contractions and leaving the gym satisfied?"

Mike Mentzer is a body builder who has drawn notable interest with his recent writings in *Iron Man* magazine. [Realize that Mike passed away in the summer of 2001.] He is of the Arthur Jones persuasion, as I am, on most points regarding exercise. Also, Mike has been the best influence among the large bodybuilders, convincing them to train harder but less. Not to take away from Mike's importance, note that I and several of my colleagues at Nautilus between 1977 and 1988 regarded Mike as the "most sane of the competing bodybuilders." We shared similar sentiments that Mike's training during those years, though the most sane, was still too voluminous. He trained less than any other comparable bodybuilder, but still far too much.

Recently Mike has written books and articles telling of his revelation that he overtrained during the 70s and 80s. This is certainly no revelation to us. In fact, some of us tried to make Mike understand. Now he acts as though he discovered this first himself. Nevertheless, it is good that he can at least admit it and convey its importance to other bodybuilders. Other large bodybuilders did not catch on until Mike forced his experience on them. And I now have Mike as an example to illustrate to the common man that most bodybuilders are steeped in tradition that espouses overtraining to their detriment.

Another shortcoming of Mike's has been his unwillingness to consider *SuperSlow Protocol.* He has the technical manual, but I have been told that he pokes fun at it and me and has not studied it carefully. I am also told by credible common friends that Mike trains with movements that are quite fast by our standards. But something has come of this—Mike has recently discovered static contractions. On the whole, Mike is obtaining another quantum leap in improvements with his clients. And this will lend credibility to those of us who elect to use it with our clients.

Meanwhile, I wonder why Mike can't partake of the *Super-Slow Philosophy*. He and I both are grounded in Jonesian/ Nautilus Philosophy. (Also, Mike is an opponent of Aerobics philosophy and we need him, as he needs us, to enlarge the front against Cooper's distracting nonsense.) This is obvious by his writings. It is also obvious by his writings that he does not realize that SuperSlow supersedes Arthur's philosophies in several areas. It is more precise, more updated, more complete.

It seems that Mike's discovery of static contraction, however, has finally forced him to slow down. Instead of going SuperSlow, he has completely stopped! He seems to have leapfrogged over the SuperSlow into the realm of isometrics. In so doing, and for once in his life, Mike has finally obtained some meaningful contractions—contractions he could have achieved earlier with an isotonic approach if he had considered SuperSlow.

Mike's approach to static contraction emphasizes the belief that the contracted or most-contracted position is the only position where all muscle fibers of a structure are involved. He does this because of his Jonesian influence. My belief is that the entire musculature becomes involved—regardless of position—with a continuous loading of adequate duration. With enough time—1-2 minutes—the nervous system appears to recruit any and all fibers. The effect serves to spread out the inroading along the entire length of the musculature. I also believe that much the same principle applies to SuperSlow.

Previous attempts by Arthur Jones to show specific and general responses positionally to inroading have been poorly performed. For example, Arthur's 1986 study with identical twins involved poor exercise standardization and instruction. I heard rumors that University of Florida research follow-ups were unable to replicate Arthur's 1986 results. Nevertheless, whether general or specific, if such types of responses truly exist, continuous static effort appears to inroad the entire structure. And this occurs regardless of the position (within the repetition) selected for this effort.

This last point is indeed useful and important. I often use a pull-down exercise for some of my subjects who might otherwise not tolerate this exercise because of neck debility. Both the beginning and completed position of this movement are often expected to exacerbate neck tension; therefore, the mid-range is the position of choice.

Mentzer's approach is to select a resistance that the subject can only lift into the contracted position with instructor assistance. Then the subject attempts to hold the contracted position as long as possible, eventually performing a negative-only repetition at the completion. Sometimes one or two additional such repetitions are performed, but Mike has gradually eliminated these.

Lifting, as in Mentzer's approach, is not necessary or desirable. Using our method, the apparatus—usually a MedX machine—is locked into position. If a chosen position proves irritating, the machine is pinned a notch or two further upward or downward.

Often the appropriate apparatus is unavailable—In this case, I hold the subject manually. This must be performed in a manner such that smooth application and de-application occurs between myself and the subject. Also, I must be strong enough and/or in a favorable position so that I can endure the resistance application so as not to be the source of problematic muscle quivering.

Since the beginning of this year, I have been forced to apply Timed Static Contractions to several of my subjects. My first mandate to apply TSC came on with the acute sacroiliac condition of a long-term (4 years) and successful SuperSlow client. After several weeks of cyclical

- dynamic Super Slow workout
- crippling inflammation
- chiropractic adjustment
- improvement
- repeat cycle

we decided that one or all of the exercises involving the pelvic articulations was/were the culprit(s). We isolated each exercise to test its response by the body. We found that the *Linear Spine® Flexion* made or permitted improvement. We decided that hip ADduction and ABduction were detrimental, especially if applied manually—with increased probability of uneven resistance application. *Linear Spine Extension* seemed to be permissible.

We detected a negative response from the MedX Leg Press. Its deleterious effect occurred regardless of the settings we applied to vary optional attitudes of the torso, legs or feet. Range delimitation appeared to help only slightly.

My first reaction was to delete the leg press entirely. This disappointed me greatly, because it is the single most important exercise for anyone, particularly for this woman.

In my determination to resume the leg press, I saw as my only recourse to lock the subject into a midrange position to perform the timed static contraction.

It worked. Not only did the subject avoid irritation of her back, she was surprised at how thoroughly her lower back, buttocks and thighs had been worked. This seemed too good to be true. We repeated the procedure for several weeks. This proved a lasting success.

I immediately saw the importance of Timed Static Contractions for other reasons and purposes. It seems that their application goes beyond merely finding a non-inflammatory position. In a rather inexplicable way, dynamic excursion involves greater neurological and motor complexity.

It demands continual musculature adjustment to contain ever-changing internal reactionary forces.

Advantages of TSC

TSC goes beyond *Super Slow Protocol* in several respects. Although SuperSlow is the most conservative—with respect to safety—of all dynamic protocols, Timed Static Contraction is yet more conservative. Its usual 25/50/75/100 percent can be made yet more conservative. A therapist may prefer 25/50/75/75, 25/50/50/75, 25/50/50/75/75 or 50/75/75/100.

TSC may also permit the subject better control and mastery of ventilation and extraneous musculature relaxation. It offers more control all around.

Eventually, I applied TSC to three severe neck debilities, as well as to two stroke victims. It was the only safe approach to address the neck debilities.

Both stroke victims suffered the usual chronic motor control losses, unilaterally. Neither were able to keep their targeted musculature on their affected side continuously loaded by dynamic SuperSlow Exercise. Only with TSC could they focus their neurological competence into effective loading of their musculature. And only with the control offered by this technique could I detect, monitor, and ensure their continuous muscular engagement.

Drawbacks

In most cases, I cannot quantify performance and progression with the application for TSC. To do so with any practical application requires some kind of machine strain gauge with readout. I have found a crude way to monitor this using some MedX machines; however this technique deserves a follow-up article.

Another problem sometimes is a psychological aversion to static contraction. Many subjects refuse to be denied the sense of completion and accomplishment obtained from lifting a weight or movement arm. Often, this is overcome by explaining the real objective of exercise as discussed on pages 23-24 of the *SuperSlow Technical Manual.*

The following appeared almost as-is in **The Exercise Standard** *in January, 1996.*

In the previous section, I briefly mentioned my experiences with two stroke victims. I have administered Timed Static Contractions (TSC) to these subjects for several months and believe their reaction and response worthy of discussion. The following expresses my experiences and reflections with the first of these patients:

This woman was sent to me by another client. She had incurred a massive stroke in January, 1992, due to incompatibility of medications. At the outset of this, she was comatose for four days, then received inpatient physical therapy beginning in late February until April, then outpatient physical therapy until December, 1992.

She started with me in May, 1995. At this time her left leg and arm remained grossly weaker and less controlled than her right, although her left leg was worse than her left arm. This affected her gait dramatically, although she was actively mobile without a walker or crutches. She wore a soft cast on her left ankle to provide lateral stability and a knee cage on her left knee to prevent passive hyperextension. The latter was removed for the workouts.

With the very first workout, I realized that a generic SuperSlow routine was not appropriate for this patient. She had function of her muscles and joints, but this function was not fluid. She had difficulty with sustained recruitment during dynamic effort. Voluntary muscular application to the movement arm was so on & off that the inroading was inefficient. This also presented some safety concerns for several of the exercises.

I immediately shifted gears, so to speak, toward TSC. I continued to administer bent-knee seated heel raises for both calves, pre-exhausting the left dynamically as I sat under her to manually control the ankle then following with dynamic work bilaterally in one routine (Routine A). In another routine (Routine B), she performed TSC exclusively for the left. With this, the machine was merely locked into a midrange position with an immovable resistance.

Even with this last approach and with me continuing to hold her ankle, her application of force was not continuous. I continually monitored the tension in her calf—by sight and feel—and reminded her to “regain” or “sustain” the muscular effort.

This sustenance of effort or muscular force is the key to the value or importance of TSC. “Effort” in the last sentence is really inappropriate in terms of the patient’s volition. She never quit trying during the 2-minute TSC interval. Her intellectual contact and focus with the target musculature, however, waxed and waned. And she was not completely cognizant of this variance. Her sensory acuity—not just her motor control—with that area of her body was incomplete and/or vague. So, when I saw the tension lessen in the movement arm pad or felt her muscles lose tension, I reminded her to regain it. Only with the TSC could she optimize the opportunity to stay nervously connected—if you will—to the target musculature.

As I mentioned in the previous installment of this topic, the muscular and nervous control of dynamic excursion—apparently—is much more complex than static contraction. And I appreciate that the difference—though I certainly

cannot quantify this difference—is much greater than what I have taken for granted with superficial observation.

This is conjecture based upon my experience: Movement involves a constant readjustment by the muscles throughout the excursion. The force vectors producing the positive movement (agonists) as well as those stabilizing the joint (antagonists and others) are in constant flux. This flux seems to confuse the patient to the extent that she cannot control the required readjustments and simultaneously devote sustained and significant muscular tension. Those readjustments must be eliminated in order to obtain the required sustenance of tension.

The least distraction causes this patient to lose intense nervous communication of the targeted musculature. This communication loss is not meant to imply that her muscles become erratic. They merely lose tension. And the distraction necessary to cause this loss might be due to me repositioning my hand, asking her a simple question, or the phone ringing in the office. This realization has made me very attuned to the consequence of my seemingly trivial actions. This realization forces me to ask myself whether any action on my part during her TSC application is truly necessary.

I have access to a MedX Seated Leg Curl machine as well as a Nautilus Prone Leg Curl. I immediately ruled out the use of the prone machine in favor of the improved control obtainable with the seated version. At first, I placed her in this machine and used its integral leg prop. Her affected leg, when used exclusively or bilaterally, fell out of the movement arm with each repetition. I knelt beside her and controlled this. What was more disturbing to me was the non-sustained loading for this limb. Eventually, I administered TSC with the movement arm pinned off in various positions. This worked barely adequately but I remained dissatisfied with three drawbacks:

- I lost valuable time with any pre-exhaustion sequence due to the equipment changes required for the prop. For example, I wanted to pre-exhaust the affected leg and immediately thereafter work both.
- I wanted a better feel for the tension she sustained in the affected limb. This was a minor complaint as I could obtain this by applying a minimal load from the weight stack and through the movement arm and by holding the movement arm handle to monitor her off & oning. This was not a problem when the affected limb was worked exclusively, but during bilateral work, I was unable to discriminate which (or whether both) leg(s) was/(were) producing the force.
- The subject seemed to have motor difficulty with such a pure rotational format. I believed I might improve her *muscular clamping* by making the hamstrings perform more of a quasi compound movement.

Therefore I abandoned the MedX Seated Leg Curl and put the patient on the Nautilus Super Leg Extension. I positioned her for performing knee extensions, but my initial interest was the knee flexion function I was to manually apply.

Using this machine as a place to perform manual knee flexion exercise, I finally admitted that there was indeed a reason or use for this machine to be designed so high off the floor. I held one or both her heels as she performed manual or TSC knee flexion exertions. I could monitor her separate limb off & oning. I could quickly change from TSC on one limb to dynamic manual on both. And she could think of the knee flexion as a movement to shorten the leg (somewhat toward her chest)—a compound movement mentality—rather than a rotational knee movement. (Before trying this with a patient please phone me.)

I also found this leg extension a suitable place to perform manual and TSC knee extension, toe raise, and hip flexion, thus greatly simplifying the workout as time and effort were saved relocating to other equipment.

Similar decisions followed regarding other exercises. The imperative, again, was to find a way to sustain loading for the patient's affected musculature. Did this work? Yes. Did this improve the patient's mobility? Yes.

On July 28, 1995, the patient and I had a private discussion. She told me that, since beginning her therapy with me, she had lost tonus in her muscles.

I was puzzled and showed it. I asked her to clarify what she meant. After I was sure that what she said was what she meant, I asked her what she meant by "tonus."

I then defined tonus for her as *residual tension in a muscle* or *that tension that remains in the muscle when it is at rest.* Hearing this, she stated that she understood the definition and that she stood by her statement that her tonus had decreased.

Now I was really confused. If I was hearing correctly, she was complaining that she had lost the very quality that I had hoped to increase. After all, as a muscle becomes stronger, its tonus increases. Although I had little to compare quantitatively—especially since I had been administering manual and TSC exercises—I had understood that she felt generally stronger. Her gait appeared better by both our accounts. Her ability to maneuver herself was improved. But now she tells me that she has lost tonus. I was momentarily disappointed and lost as to how to correct this problem.

I questioned her again. I asked her to tell me all she understood about tonus from her previous physical therapy sessions. She remarked that her therapist had often remarked that she had much tonus; and that this tonus was the culprit of her spastic motor action. Therefore, tonus was positively

correlated with spasticity and was believed to be a bad thing, a thing to reduce and eliminate. By this line of reasoning, and consistent with what both of us agreed tonus to be, I should have been trying to make her weaker!

She then saw my misunderstanding. She emphasized that she was greatly better—not worse as I was interpreting, particularly that her spasticity was markedly reduced and that her motor control for many different activities was improved—a dramatic improvement that she noted within the first month of her therapy with me.

I explained to her that she was stronger and therefore the tonus was greater, albeit that her spasticity was decreased. Knowing this relationship, we both had to admit that increased strength and tonus must reduce spasticity. We then both admitted that the therapy community had the correlation between tonus and spasticity backwards—a very important possibility that I had never before considered. Later, during her workout, it dawned on me that this backwards correlation might be the very reason that therapists fear strengthening stroke victims. They believe that the spasticity will worsen with increased tonus and strength.