

Product Review: Compex Sport 400 Electronic Muscle Stimulator

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I've always been fascinated by technological gadgets. I love my notebook computer, my PDA, my heart rate monitor, my DVD recorder with its huge hard drive and my many other so-called functional electronic devices. My wife can't understand me and my fascination with gadgets. She refers to me as her "Techno-weenie." I'm still not sure how to take that.

So, it is no surprise that I was absolutely captivated by the concept of Electronic Muscle Stimulation (EMS) as a training tool for the field of Strength and Conditioning. I had read an article about EMS way back in the 1980's by a track coach named Charlie Francis and the concept immediately made sense to me. The article was very to-the-point about the benefits of EMS as an add-on to your existing training program. I was hooked: techno-gizmo and training tool in one.

My History with EMS

As an athlete, I was only exposed to EMS from a rehabilitation approach. Muscle stims were used by my physiotherapists to help retrain muscles, address pain and increase circulation. Whether or not they were used to their maximum effect is another discussion, but I began to recognize the potential of the technology. The only problem was that I had no money to buy an EMS unit for my own personal use and experimentation.

Once I finished university and started earning an income I was able to purchase a small EMS unit. It was a simple EMS-TENS unit that had four leads and individual knobs for intensity, frequency and contraction time. The unit allowed for variable contraction times between one and ten seconds. The only downside of the unit was that relaxation time was fixed to three seconds. In order for an athlete to realize the full benefits from EMS for maximum strength, a contraction time of ten seconds combined with a relaxation time of 50 seconds must be used, as determined by Dr. Y. Kots (1977) and reiterated by Charlie Francis. I tried to go with ten second contractions and three second relaxations, but it was pretty rough and I started cramping up. I even resorted to going with ten second contractions, then ripping the leads out of the machine to ensure that I had 50 seconds of rest. Then I would plug the leads back in for my next series of contractions. It was a real inconvenience, especially if I plugged the leads back into the wrong slots.

My second EMS unit was bought used from a poor guy who was in a car accident and had to have metal rods put into his legs. Needless to say, he had no interest in being a human lightning rod and sold me the unit for a great price. This unit had the ability to dial up variable contraction and relaxation times between zero and 40 seconds. I couldn't get 50 seconds of relaxation time, so I modified my parameters and went eight seconds on and 40 seconds off (one to five ratio). It worked well, but the EMS unit was big and clunky and resembled a small respirator – not very convenient.

The Compex Muscle Stimulator

So then began the Compex era of my experience with EMS. I had heard great things about Compex from Charlie and others on CharlieFrancis.com. Never one to doubt Charlie's recommendations I took the plunge. I did my research on the internet to find out which model would be the best for my purposes and came up with the Sport 400 model. Finding a good deal on a Compex unit was also a challenge as they were not yet available in North America. I ended up ordering one from a London-based on-line cycling store – Pearson Cycles. It was the best price I could find. Once I received the Sport 400, I was thrilled. All I needed to do to get it working was to buy a small, inexpensive power supply adapter from Radio Shack so that this European appliance could work with my North American outlets.



The Compex Sport 400 came in a stylish case and included the following items:

- A battery charger
- One set of electrode cables (blue, green, yellow, red)
- 4 bags containing the electrodes:
 - 2 bags with 4 small electrodes (5x5cm)
 - 2 bags with 2 large electrodes (5x10cm)
- A user manual
- A CD-ROM containing the Training Planner
- A CD-ROM with Specific Applications (Sport 400, INFO)

As I said before, if you are in North America and you are purchasing a unit from Europe, you'll need a simple power supply converter and it will work no problem. Compex USA now offers a Sport model that is similar to the Sport 400, so you can buy one direct from them (although the US Sport Model has fewer programs than the similar looking Sport 400).

Most other EMS units that I've seen are pretty clinical looking – boxy with big ugly knobs. Not the Sport 400. It is sleek looking and has simple, yet attractive, buttons for navigating the programs and setting your intensities. I'd say that the Compex units are pretty much the I-Pods of muscle stims. The unit also emits different tunes to tell you that it is on or that the EMS session has been completed. I also like the fact that the four cables/leads for the Sport 400 are

colour coded. This is a great idea as you want to be able to differentiate between your different leads and the buttons that are controlling them. I know with my older stims, I'd always pump up the intensity for the wrong lead because the wires were intertwined and you wouldn't know which muscle would get the brunt of it until it was too late.



The Sport 400 also came with a good supply of EMS sticky pads. These are great. With my older units, I would use the big ugly pads with the contact gel and the awkward Velcro straps. The sticky pads make it so much easier to set up the EMS session, and they are good for multiple sessions.

The user manual is very helpful for navigating the Sport 400 menu system and also has a nice diagram at the back to help you with pad placement. In addition, Compex provides a CD-ROM with more specific information on how to use the individual Compex programs for different sports. The CD-ROM asks you your sport of choice, the number of hours per week you train, and where you are in your training program. The software then produces recommendations for EMS sessions and the particular settings for the Compex unit.

It's important to point out that all of the EMS settings with the Sport 400 are fixed. This means that you cannot manually set your contraction times, relaxation times and your frequency. You can only control the intensity of the contraction for a given Compex program. This may be a drawback for the person who wants total control over all of the settings for the EMS unit. However, there are many advantages of the Compex Sport 400 that outweigh the lack of manual settings capability.

In the figure below, I have outlined the different programs and settings for the Compex Sport 400. My data for the contraction and relaxation times are purely observational, and not based on any specifications provided by Compex. I assume that Compex is not freely providing this information as it may be part of their trade secrets. Hopefully my table will help you to understand what the Sport 400 offers.

| Complex Program | Time ON | Time OFF | Frequency (Relative) | Ratio of Work/ Recovery |
|-----------------------|--------------------------------------|----------|----------------------|-------------------------|
| Sport | | | | |
| Strength | 4 | 22 | High | 0.18 |
| Explosive Strength | 3 | 30 | High | 0.10 |
| Endurance | 7 | 3 | Moderate | 2.33 |
| Potentialiation | Pulsing/Building | | Low to High | |
| Resistance | 7 | 10 | Moderate/High | 0.70 |
| Hypertrophy | 4 | 10 | Moderate/High | 0.40 |
| Concentric | 1.5 (<i>Decreasing Intensity</i>) | 20 | High | 0.08 |
| Eccentric | 2 (<i>Increasing Intensity</i>) | 20 | High | 0.10 |
| Plyometry | 22 sec. cycles | | Low to High | n/a |
| Stretching | 6 | 26 | Low to Moderate | 0.23 |
| Active Recovery | Pulsing | | Low/Moderate | n/a |
| Regeneration | Pulsing | | Low/Moderate | n/a |
| Pain | | | | |
| Sophisticated Tens | Steady Current | | Low | n/a |
| Endorphinic | Pulsing (Moderate) | | Low/Moderate | n/a |
| Contracture | Pulsing (Slow) | | Low | n/a |
| Cervical Pain | Pulsing (Fast) | | Low/Moderate | n/a |
| Thoracic Back Pain | Pulsing (Fast) | | Low/Moderate | n/a |
| Low Back Pain | Pulsing (Moderate) | | Low/Moderate | n/a |
| Lumbosciatica | Pulsing (Moderate) | | Low/Moderate | n/a |
| Lumbago | Pulsing (Slow) | | Low | n/a |
| Arthralgia | Steady Current | | Low | n/a |
| Epicondylitis | Steady Current | | Low | n/a |
| Cramp Prevention | Pulsing (Fast) | | Low/Moderate | n/a |
| Rehabilitation | | | | |
| Disuse Atrophy | 6 | 9 | Moderate/High | 0.67 |
| Muscle Growth | 6 | 7 | Moderate | 0.86 |
| Reinforcement | 5 | 12 | Moderate/High | 0.42 |
| Vascular | | | | |
| Capillarization | Pulsing (Fast) | | Low/Moderate | n/a |
| Heavy Legs | Pulsing (Fast) | | Low/Moderate | n/a |
| Drainage | 5 | 25 | Moderate | 0.20 |
| Fitness | | | | |
| Muscle Starter | 7 | 10 | Moderate/High | 0.70 |
| Muscle Building | 7 | 13 | Moderate/High | 0.54 |
| Aerobic | 7 (<i>Pulsing</i>) | 5 | Low/Moderate | 1.40 |
| Aesthetic | | | | |
| Muscle Tone | 7 (<i>Pulsing</i>) | 12 | Low/Moderate | 0.58 |
| Muscle Firming | 9 (<i>Pulsing</i>) | 9 | Low/Moderate | 1.00 |
| Shaping | 6 | 13 | Moderate/High | 0.46 |

Programs Provided by The Compex Sport 400

The Sport 400 provides a wide variety of programs under the categories of Sport, Pain, Rehabilitation, Vascular, Fitness and Aesthetic. I will do my best to describe what is involved in each of these programs with the hope that it will allow to understand what the Compex Sport 400 can offer for athletes.

1. Sport

The Sport programs for the Compex Sport 400 primarily focus on developing specific muscle properties (strength, hypertrophy, power, endurance). Although the actual ‘Strength’ program does not follow the 10 seconds on, 50 seconds off recommendation of Dr. Y. Kots and Charlie Francis, it does approximate the same ratio of work to rest (4 seconds on, 22 seconds off). Other Sport programs follow a work to rest ratio progression similar to that found in conventional training (i.e. higher intensity work = shorter work with longer rest, lower intensity work = longer work with shorter rest). Other Sport programs include Potentiation, Plyometry, Concentric, Eccentric, Stretching, Active Recovery and Regeneration.

The Potentiation program is interesting, as it is designed to be used as part of a warm-up. I don’t know if there is a practical application for this program, which involves cycles of slow to rapid pulses, finishing in a strong contraction. I would think that a conventional warm-up would work better. However, a few of my athletes were involved in bobsleigh this year and told me about the lack of warm-up areas at the top of the bobsleigh runs in Europe. I could see them using this function to supplement whatever other warm-up activities they could manage.

The Concentric and Eccentric programs are intended to be used with actual weightlifting exercises, providing a contraction on either the upward (concentric) or downward (eccentric) part of a lift, such as a squat, with a recovery period for the opposite action. The Plyometry program is a progression of pulses and contractions performed over a 22 second cycle, increasing in intensity over this period. The Stretching program provides a steady contraction between static stretches, so that the Sport 400 acts as a partner helping an athlete with PNF exercises. The final two Sport programs are Active Recovery and Regeneration, which simply perform a circulatory function by pulsing the muscles, kind of like a flushing massage.

2. Pain

The Pain programs for the Sport 400 vary between TENS-like sensations and pulsing actions. My feeling is that the TENS-like, steady-current programs (pins-and-needles feeling) are used to reduce the sensation of pain, while the pulsing programs slowly fatigue motor points, thereby reducing muscle tone and creating a release in the affected muscle. Personally, I found that many of these programs have proven useful. I tend to have muscle spasms in the cervical-thoracic regions of my back, from an old whiplash injury. The Cervical and Thoracic programs have helped to expedite recovery from these spasms, which have lasted up to five days prior to use of the Sport 400. Additionally, I’ve had some cramping problems in my legs that are easily treated by the Cramp Prevention program. I’ve also tried many of the other Pain programs with much success.

3. Rehabilitation

These programs are essentially a combination of the Strength and Hypertrophy programs offered in the Sport program section. I've used all of the rehabilitation programs with some of my athletes, and had some notable results with an athlete coming off ACL surgery. It was a great way to incorporate strong muscle contractions into an athlete's rehab program without creating any stress on the knee joint. It was also a psychological lift for the athlete, because she knew that she was getting quality work in the quadriceps and hamstring muscles without having to do deep, heavy squats (which were contra-indicated at the time).

4. Vascular

The vascular programs are a series of pulsing programs that pretty much create a circulatory response. They also seem to be good at reducing muscle tone and relaxing the muscles, similar to a number of the Pain programs.

5. Fitness

The fitness programs appear to be more similar to the Hypertrophy and Endurance programs in the Sport category. I don't know if it was necessary to create a separate Fitness category, with so many Sport programs provided. They are a bit different, so I guess it's nice to have more programs than less.

6. Aesthetic

Again, like in the Fitness category, these programs are along the lines of a general strengthening program to enhance muscle appearance rather than build maximum strength and contractile force. They are nice if you want a lower intensity EMS workout but probably not as effective for athletic performance. I'll strap it to my abs periodically while sitting in front of the TV and munching on a donut. It's pretty much the best way to engage in 'active rest.'

Other Features

One of the more convenient features of the Compex units is that they incorporate warm-up and cool-down periods in many of the more intense programs. This entails about five minutes of work on each end of the workout, with slow pulses gradually increasing in intensity and frequency for the warm-up, and working in the other direction for the cool-down. It's a nice feature that makes sure that your muscles are ready for the work ahead, as well as calms them down at the end of the session.

The Compex units also have you select the region of the body that you intend to work. There is a small illustration of a person in the screen that you scroll through to find the specific part of the body (i.e. neck, shoulders, arms, chest, abdomen, glutes and lower extremities) you want to target. There are also funny animations of a guy warming up, lifting a weight, etc. while the unit is working.

Summary

I highly recommend the Compex line of muscle stimulators. My Sport 400 is easy to use, comes with more programs than I need and is very compact and portable. The unit charges up easy and holds a charge for a long period of time. What you may lose in terms of flexibility (manual programs), you most certainly gain in terms of convenience. The one thing I find with my Sport 400 is that I used it much more frequently than any of my previous EMS units because of the convenience factor. If your EMS unit is cumbersome, I can bet that it won't be used as frequently as you would like.

Compex USA also sells replacement cables, chargers, sticky pads (although you can buy aftermarket sticky pads pretty much anywhere as they are universal) and rechargeable battery packs. As their products become more popular in North America, I assume that their product line will also expand to match that available in Europe.

Compex Sport 400

Pros:

- Compact and lightweight
- Intuitive design and menus
- Colour coded cables
- 35 different preset programs
- Warm-up and cool-down programs built in
- Rechargeable
- Supplied software and training aids

Cons:

- Price (but most quality EMS units are not cheap)
- Lack of manual settings