# POWER Performance

## High-intensity noxious electrical stimulation can provide immediate and long lasting pain relief for performing artists

by Tara Jo Manal, MPT, OCS

For performing artists such as dancers, musicians, gymnasts, and figure skaters, pain and injury can severely limit practicing and performing. When the source of the pain is noncontractile (tendon, synovium) and can be isolated during the physical therapy examination, high-intensity noxious electrical stimulation can provide immediate and long lasting pain relief. This protocol may also prove useful to therapists treating injured artists for a same-day performance as well as off-season artists not responding to typical pain-control modalities.

### Russian Beginnings

Russian scientist Yakov Kots is best known for developing the "Russian Current" in electrical stimulation terminology. His work in this area centered primarily around muscular strengthening. However, he described another use of this current for tendon healing and pain control during a visit to the United States following the 1976 Olympic games in Montreal. Although the theory behind the 12-on/8-off cycle used in this application was lost in translation, high intensity electrical stimulation at the site of pain has since shown prolonged and effective pain relief.[1-3]

Patients treated with high-intensity electrical stimulation demonstrate improvement in pain levels and performance on functional tests. However, the reason for this success remains unclear.

The immediate decrease in pain following electrical stimulation may be explained by interelectrode analgesia. However, the short-lived analgesic phenomenon, resulting from a peripheral blockade of A-delta fibers, does not explain the hours and days of pain relief often reported after this modality.[4,5] Although there are many theories about the relationship between electrical stimulation and pain perception, none has been tested using the parameters described here.

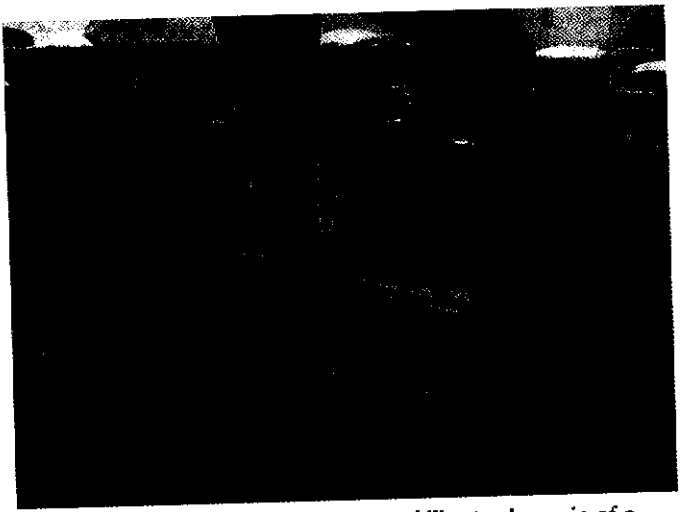

*Figure 3: This activity reproduces the achilles tendon pain of a ballet dancer. This position can be retested to demonstrate improvement following electrical stimulation.*

pain and limiting her ability to dance.

In the clinic, she rose onto the ball of her foot and we recorded her pain levels (see Figure 3). We administered a trial of high intensity noxious electrical stimulation to see if it would lessen her pain. She demonstrated a positive response to her first treatment (see Table 1).

Afterwards, we established a program of friction massage to the achilles tendon insertion, calf strengthening exercises, and a home program of calf strengthening, stretching, and ice massage. Her pain rating and ability to dance remained improved between her first and second treatment sessions, indicating that the gains from the first treatment were not only immediate but prolonged.

**Table I – Case I : A Ballerina with Achilles tendonitis**

| Treatment Condition | Pain Level* | Clinical Test |
|---|---|---|
| Pre-treatment #1 | 2/10 | 3 repetitions of releve** |
| Post-stimulation #1 | 0/10 | 10 repetitions of releve** |
| Pre-treatment #2 | 1/10 | 8 repetitions of releve** |
| Post-stimulation #2 | 0/10 | Releve+ and jumping |
| Pre-treatment #3 | 6-8/10 | 1 repetition of pointe*** |
| Pre-treatment #5 | 0.5/10 | Palpation of Achilles tendon |
| Post-treatment #5 | 0/10 | Full pain-free return to dance |

* 0 (no pain) – 10 (worst imaginable pain)
** Raising onto the ball of the foot
*** Raising onto her toes

After her second treatment, she returned to pain-free jumping and dancing on the balls of her feet. At this point, she still complained of an inability to dance on her toes. We reproduced her pain with palpation to an area slightly more proximal on her Achilles tendon than previously treated. We adjusted the location of the stimulating pads in response to her new pain location.

To create a clinical test of her pain complaint, she brought her dance shoes to the clinic and attempted to rise onto her toes. The position reproduced the pain, and we used this new clinical test position to assess the continued benefits of the intervention. She responded well and the program continued on

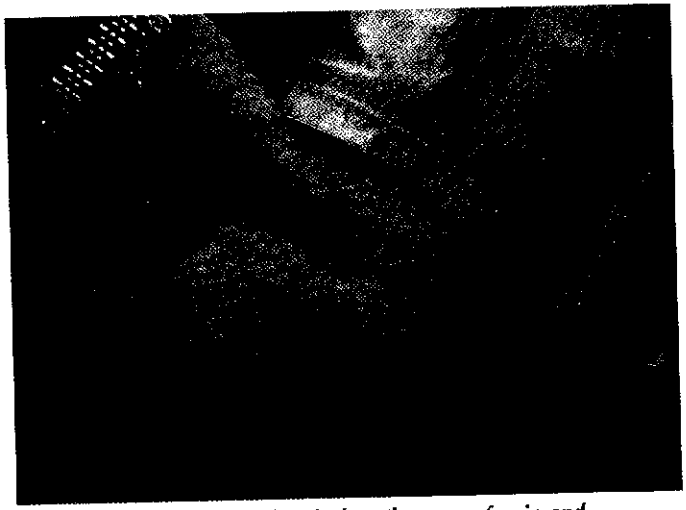

***Figure 4: Palpation can often isolate the area of pain and reproduce the patient's complaint.***

the fourth treatment. By the fifth treatment, she told us that she had been able to participate fully in her dance program including dancing on her toes, although she remained concerned that she had not yet attempted a performance.

We decided to give her a final treatment of the stimulation since we were able to reproduce some level of pain with palpation. We asked that she follow up with a phone call to report her status. After the fifth treatment, she was discharged over the phone with a full and pain-free return to dancing.

**Table II – Case II: Male Ice Dancer with Anterior Knee Pain**

| Treatment Condition | Pain Level* | Clinical Test |
|---|---|---|
| Pre-treatment #1 | 7/10 | Single leg Squat – unable to perform without support |
| Post-stimulation #1 | 0/10 | Single leg squat – able to perform independently |
| Pre-treatment #2 | 5/10 | Palpation of VMO insertion |
| Post-treatment #3 | 0/10 | Full pain-free return to ice dance |

*0 (no pain) – 10 (worst imaginable pain)

## Case II: Injury on Ice

A 28-year-old male national-level ice dancer fell directly on his knee just prior to a national competition. He used crutches and ice to travel and return home. We evaluated him 7 days after his injury. He complained of anterior knee pain with knee flexion limiting his ability to push off while ice-skating. At the time of the evaluation, he could not perform any of his ice dance routines.

We recreated his symptoms with palpation of the VMO insertion to the superior/medial patella (see Figure 4). A single leg squat recreated the pain. In fact, the pain was so intense that he could not perform the squat without a table for support. Since the pain complaint was focal and reproducible, we attempted a trial of high-

## Protocol for Pain Management Using High Intensity Noxious Electrical Stimulation

1. Isolate the source of the pain (palpation, clinical test).
2. Establish a baseline of the patient's pain level (pain rating, visual analog scale, pain questionnaire).
3. Identify a pain reproduction test (artistic specific movement, pain with squatting, etc).
4. Prepare the skin with alcohol and test for adequate sensation.
5. Apply two small electrodes (2 cm by 4 cm) and enclose painful area with electrodes.
6. Secure electrodes with tape to prevent migration.
7. Set parameters on the electrical stimulation unit (2500 Hz sine wave, 50 bursts/sec, 50% duty cycle, and 12 seconds on, 8 seconds off, with a 2-second ramp time). Treatment time should be 10 to 15 minutes.
8. Inform the patient that the sensation should be an intense uncomfortable tingling, not a burning sensation.
9. Increase current intensity to patient's maximal pain tolerance.
10. Increase current intensity within the treatment session as tolerated.
11. After the treatment, retest the patient's pain levels using the baseline pain level rating and/or the pain reproduction test.
12. If an improvement in pain level is recorded, continue treating with this modality until the pain is abolished.
13. If no change in pain level is recorded, discontinue this modality.

intensity electrical stimulation. Immediately after the stimulation, he squatted pain-free with single leg support (see Table II, page 16).

When he returned for his second treatment, he was still able to squat pain-free, however, he continued to have pain when doing more advanced skills on the ice. He pointed to the pain source and it was considerably smaller than indicated during his initial evaluation. We palpated the area and matched the pain he felt on the ice. We repeated the high intensity electrical stimulation and added continuous ultrasound, quadriceps stretching, and friction massage to assist healing in the painful area. After three treatments including high intensity electrical stimulation, he returned to full pain-free skating. ■

## About the Author

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