

# Presentation of the latest studies about TECAR



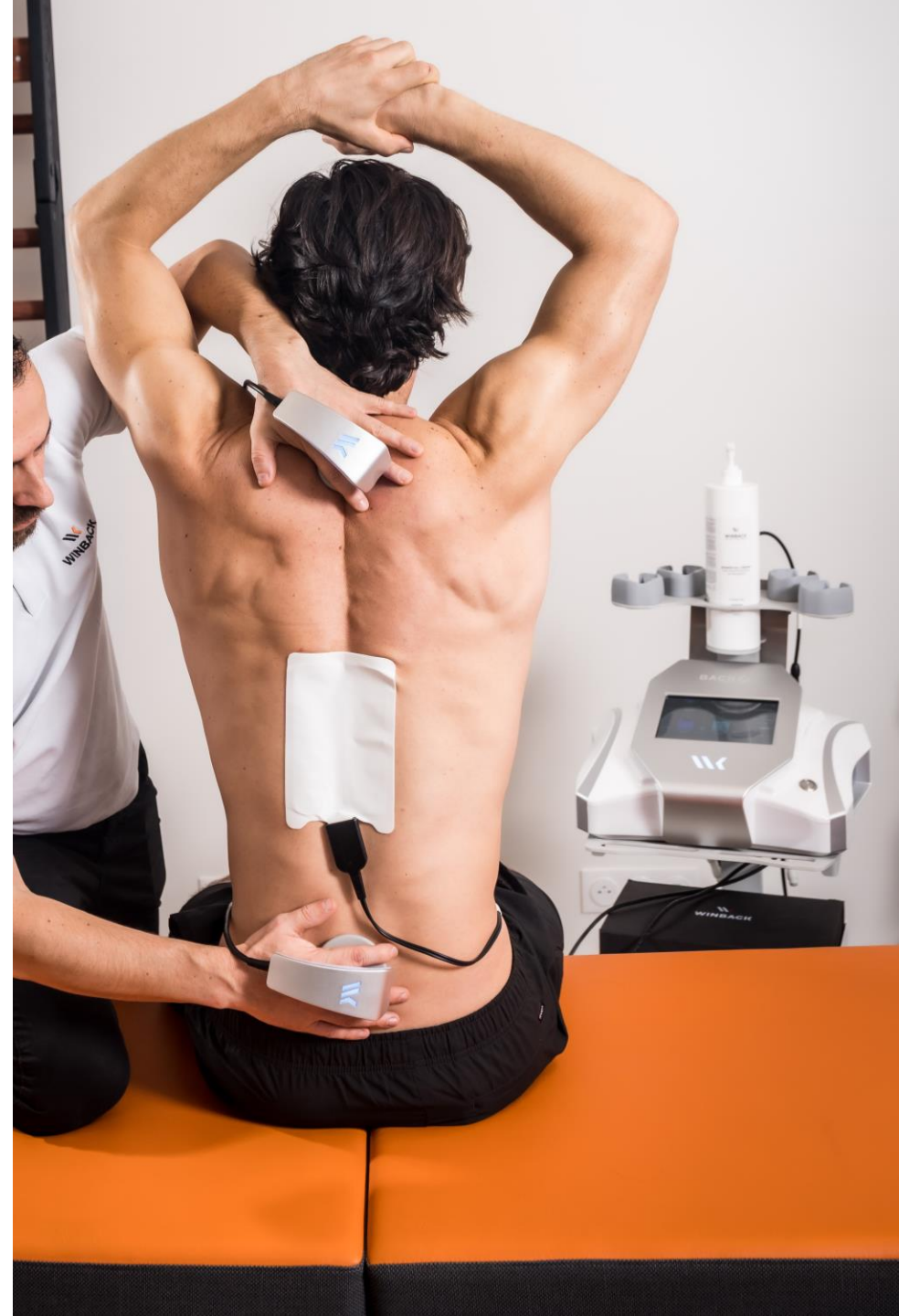
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Scientific affairs and project manager Winback



**Frédéric DELACOUR**

Sports physiotherapist  
President of Winback Academy



Review of scientific studies in  
TECAR since 2020

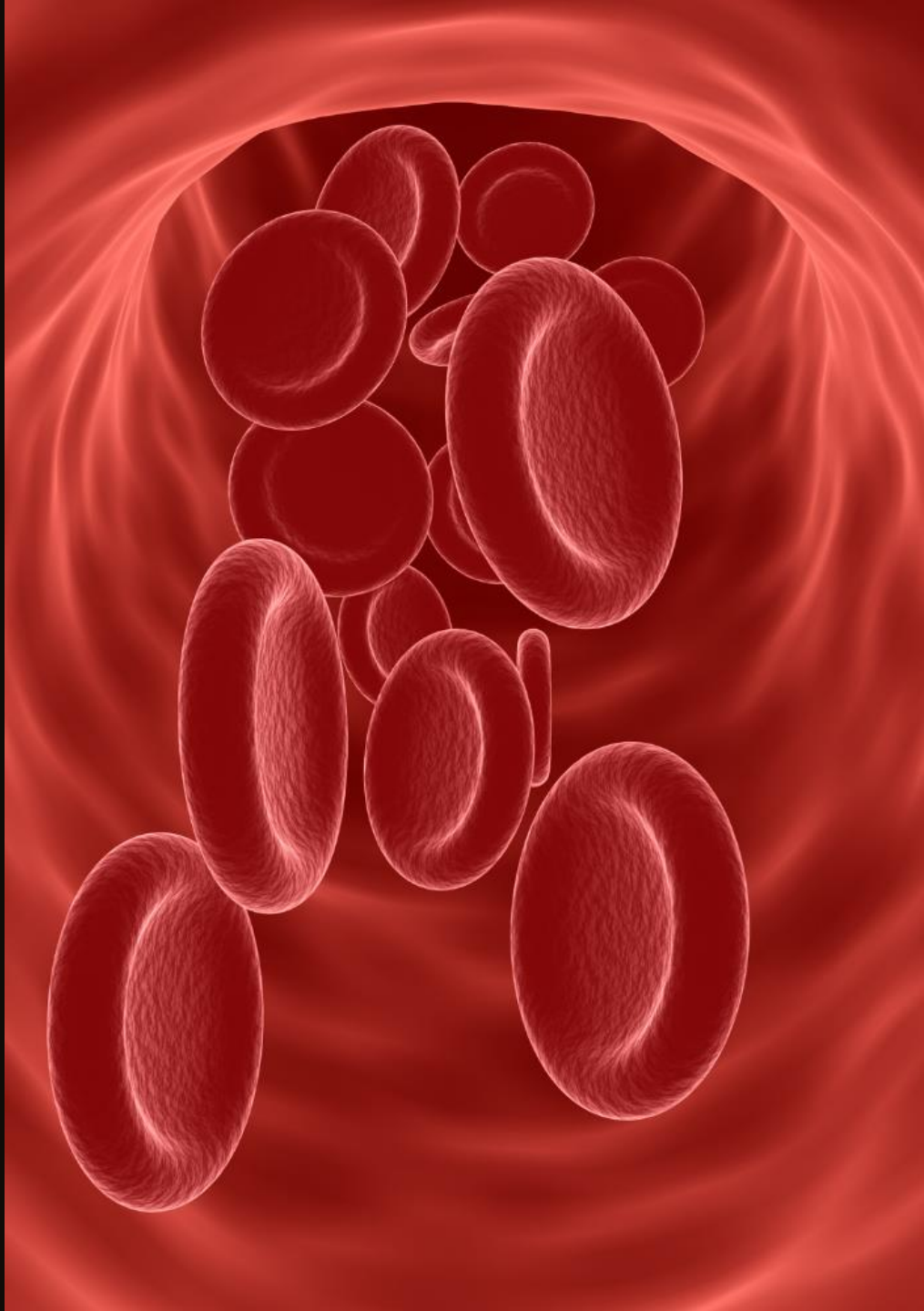


## Summary table of the latest studies in TECAR (2020-2024)

Pain	Energy	Amplitude	Function, Discomfort Dysfunction	Function (chest flexibility)	Temperature /Thermal Change	Blood perfusion (physiological)	Aesthetic	No effect	
Beltrame (2022)	Dan Alexandru (2022)	Laura Garcia-Rueda (2023)*	Laura Garcia-Rueda (2023)*	Dan Alexandru (2022)	David Arguelles (2020)*	Jacobo Rodriguez (2022)	Luis De Sosua-De Sousa (2020)	Jesùs Rodriguez Lastra (2023)*	Luis De Sosua-De Sousa (2020)
T. Paolucci (2020)*	Babak Vahdatpour* (2022)		Parc Chanhee (2023) *	Constantinos Kasimis (2023) *	Mireya Becero (2020)	Dan Alexandru Szabo (2022)	Yuto Tashiro (2020) *	Maria Luisa Hernandez-Bule (2021)	Andreia Noites (2021)
David Arguelles (2020)*	Constantinos Kasimis (2023) *		Michio Wachi (2022) *	Joanna Siernska (2023) *		Luis De Sosua-De Sousa (2022)	Jacob Rodriguez-Sanz (2020) *	Elena Toledano-Macias (2024)	
Mireia Yeste-Fabregat (2021)*	Joanna Siernska (2023) *		Tsubasa Bito (2020)	Masatoshi Nakamura (2022) *		Carlos Lopez-de-Celis (2021) *	Ron Cijssen (2020)	Maria José Hombrados Balza (2021)*	
Michio Wachi (2022) *	Parc Chanhee (2023) *			Max Canet-Vintro (2024)		Mireia Yeste-Fabregat (2021) *		Ana Luisa Vale (2020)	
Milia Benito (2022) *	Luigi Brusciano (2023) *			Joel Pollet (2023)		Simona Valentini (2021)			
Joel Pollet (2023)	Masatoshi Nakamura (2022)								

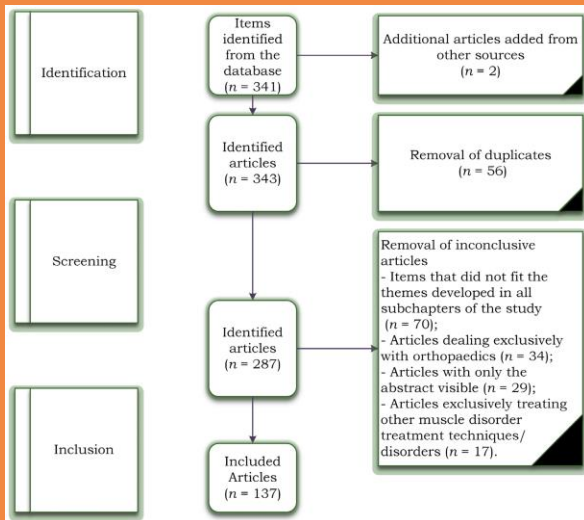
# 01

Studies on physiological effects



## EFFECTS STUDIES: THEORETICAL

- › Literature review between December 2021 and April 2022
- › Limits to the theoretical framework
- › Analysis of valid and reliable measurements



## TECAR therapy combined with high-intensity laser therapy (Hilt) and manual therapy in the treatment of muscle disorders: a literature review on theorized effects supporting their use - Alexandru Szabo (2022)



### Observed interests:

- Useful for different pathologies
- A balance between the therapist's manual ability and the unique energy of technology
- **Better blood circulation**, which **eliminates inflammatory catabolites**
- Also significantly improves blood circulation in **the peritendinous region** and increases hemoglobin saturation
- **Increased collagen tissue extensibility** due to reduced viscosity
- **Stimulation of drainage**
- Oxygenation + local vasodilation...



### *Conclusion :*

"TECAR therapy combined with manual therapy and high-intensity laser therapy in the treatment of muscle diseases, presented an **optimal collaboration in the recovery process of all muscle diseases.**"

*Access the study:*



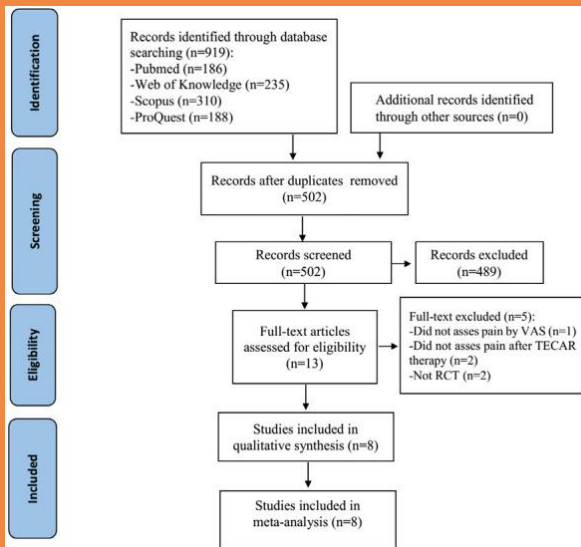
› Inclusion

Case-control study

Randomized

VAS Analysis

- Limit: the number of articles and the quality of certain studies



Access the study:

Observed interests:

Effect on standardized mean difference in the Tecar VS control group => **positive effect on pain** with significantly lower pain level after **4 weeks of intervention**

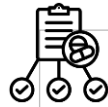
- › Interest in 3 physiological effects: **antispasmodic, analgesic and metabolic**
- › Early use in low back pain => interest in acute to reduce severity
- › Tecar > Laser for pain relief in low back pain

Conclusion :

« Our results provide appropriate evidence for **the efficacy of TECAR therapy on musculoskeletal pain**. Therefore, TECAR therapy can serve as a complementary treatment to physiotherapy. »

## Capacitive and Resistive Electrical Transfer Therapy in Rehabilitation: A Systematic Review - Beltrame (2020)

- › **276 articles**, of which 13 met the inclusion criteria for this review
- › 75% of studies used a similar frequency range (440-600 KHz)



### Observed interests:

- **Improved strength and function**
- **Reduction in pain intensity after treatment**



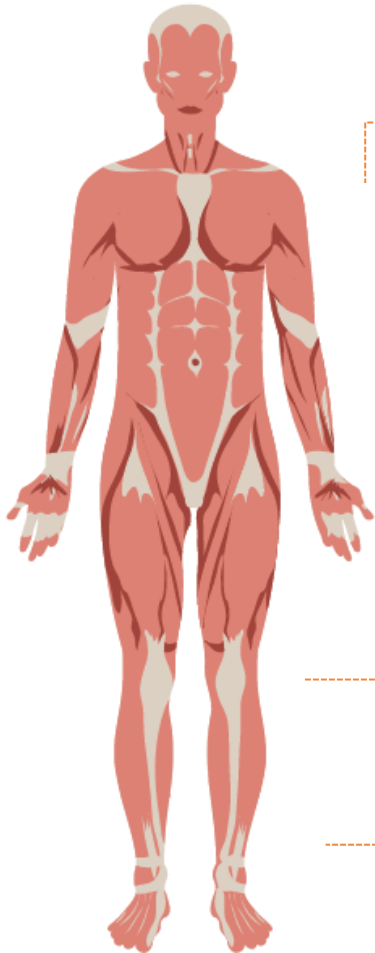
### *Conclusion :*

«TECAR appears to be an effective **therapy for reducing pain and improving quality of life and disability in patients** with musculoskeletal disorders. »

*Access the study:*



## »»» Cadaveric studies



*Effects of Temperature and Current Flow of Different Electrode Placements in **Shoulder** Capacitive-Resistive Power Transfer Applications: A Cadaveric Study* Jacobo Rodríguez-Sanz *BMC Musculoskeletal Disorder* February 4, 2021; 22(1):139.



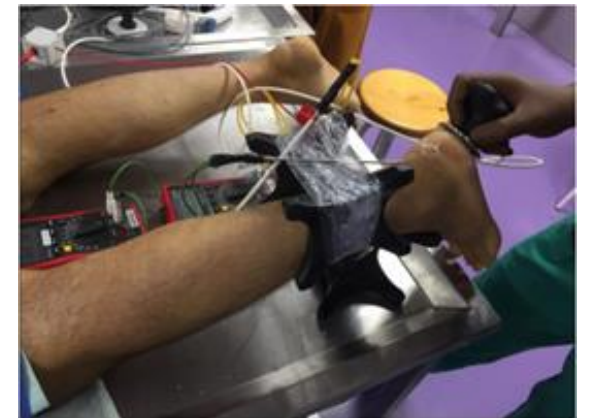
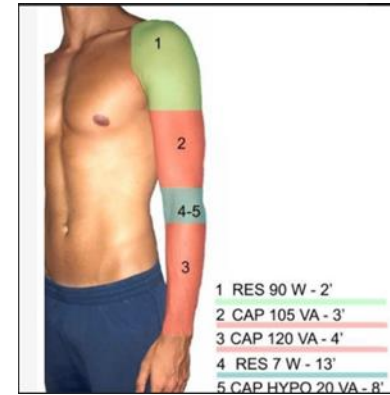
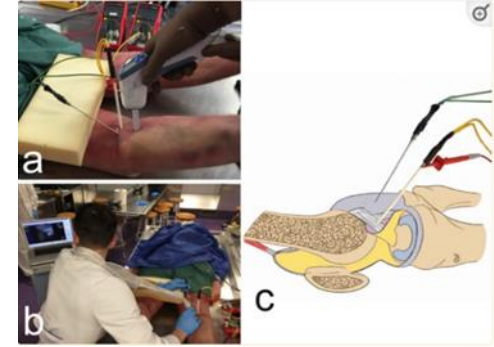
*Thermal and current flow effects of a capacitive-resistive electrical transfer application protocol on **chronic elbow tendinopathy**. A cadaverous study* Carlos López-de-Celis.



*Thermal and Non-Thermal Effects of Capacitive-Resistive Electrical Transfer Application on **Different Knee Structures**: A Jacobo Rodríguez-Sanz Cadaveric Study.*

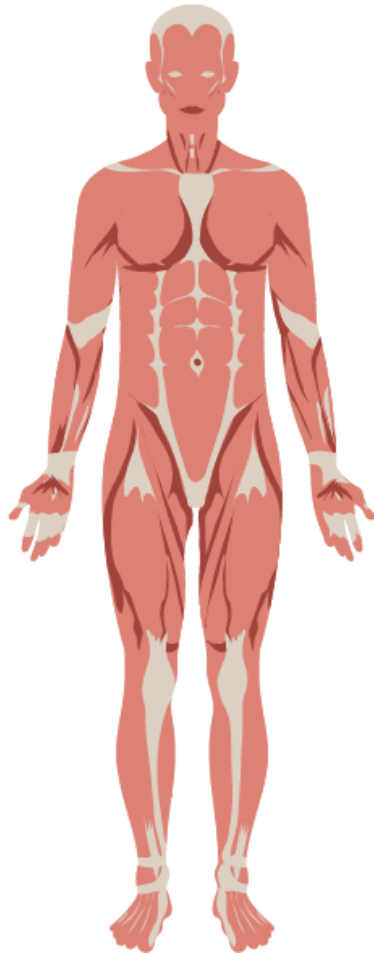


*Thermal and Non-Thermal Effects of Capacitive-Resistive Electrical Transfer Application on the **Achilles Tendon and the Musculotendon-Tendon Junction of the Gastrocnemius Musculo-Muscle**: A Cadaveric Study* Carlos López-de-Celis.

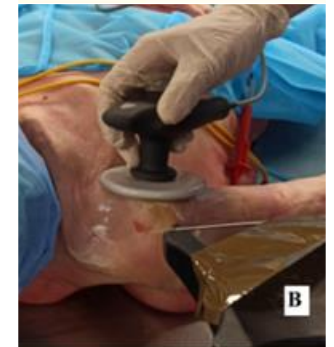




## »»» Cadaveric studies

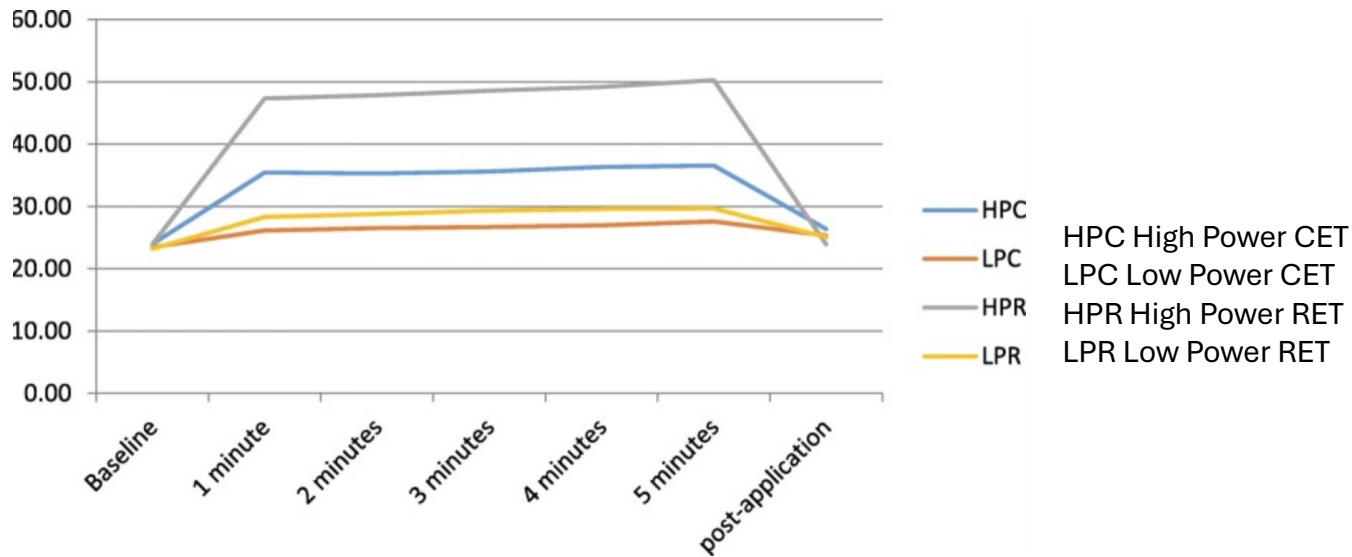


- › *Internal measurements (digital and thermocouple thermometer)*
  - › *Current Analysis*
  - › *Either capacitive or resistive.*
- **Significant increase in tendon *temperature both locally and remotely depending on the current***
  - **Significant increase in capsule temperatures**
  - **Low-power resistive** (non-thermal current): tissue proliferation
  - **High-power CET in the postero-superior position** was the only one to significantly increase surface temperature compared to the same application in the antero-lateral position.
  - **No significant differences in temperature changes of the glenohumeral joint capsule or supraspinatus tendon**
  - High-power resistive application in the postero-superior position significantly increased the surface temperature compared to the same application in the anterolateral position



## »»» Studies on diathermic effects

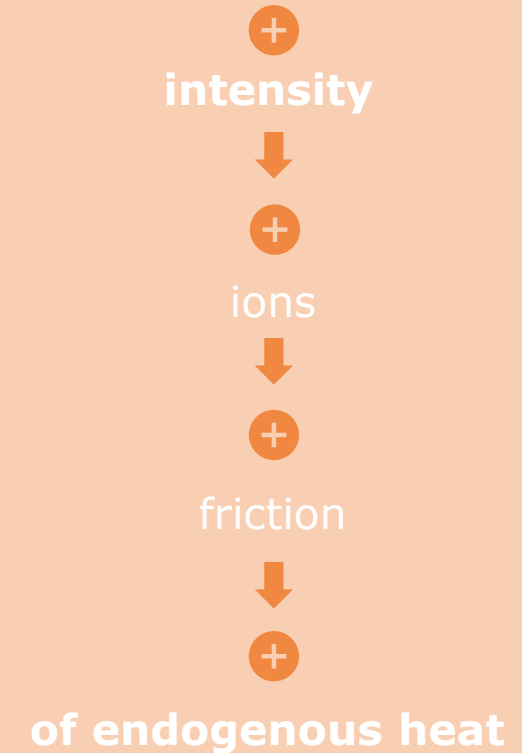
### Intensity-dependent temperature measurement



*Thermal and Non-Thermal Effects of Capacitive-Resistive Electrical Transfer Application on the Achilles Tendon and the Musculotendon-Tendon Junction of the Gastrocnemius Musculo-Muscle: A Cadaveric Study Carlos López-de-Celis*



Reminder: In biology, the reaction of the tissue to the passage of the high frequency current is **DIATHERMY**.



## »»» Conclusion of physiological effects



### CET low intensity

Low surface temperature rise may be useful for **muscular or tendon acute conditions**



### CET high intensity

Increased temperature across all tissue layers may be of interest in **chronic** phases to remodel and improve tissue **viscoelasticity**.



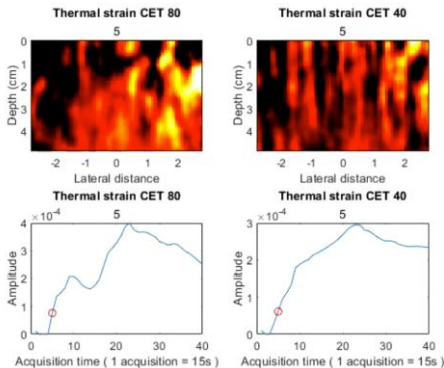
### RET low intensity

Limited thermal effect, but deep current transmission may be useful for **cell proliferation** and thus tissue healing in **acute** phases.

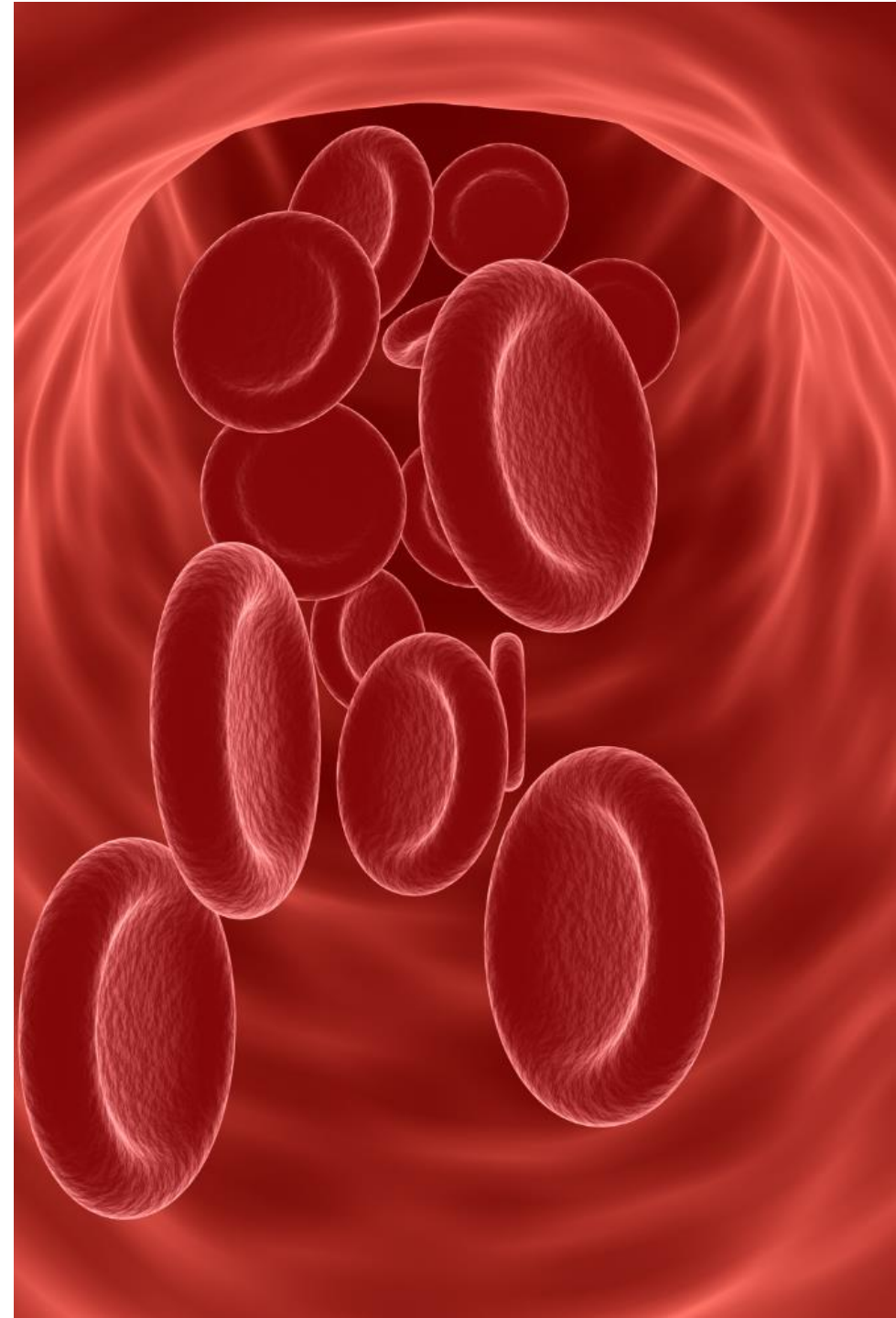


### RET high intensity

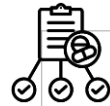
Significant thermal effect, current transmission, with **periarticular thermal increase** that can help the **viscoelasticity** of thick tissues in situations of significant trophic change.



Scan this QR code to access our study in collaboration with the CNRS



Does the application of Tecar therapy affect the temperature and perfusion of the skin and muscle microcirculation?  
A Pilot Feasibility Study on Healthy Subjects, Ron Clijsen, J Altern, Supplement Med, 2020, February; 26(2) : 147-153



Effects observed:

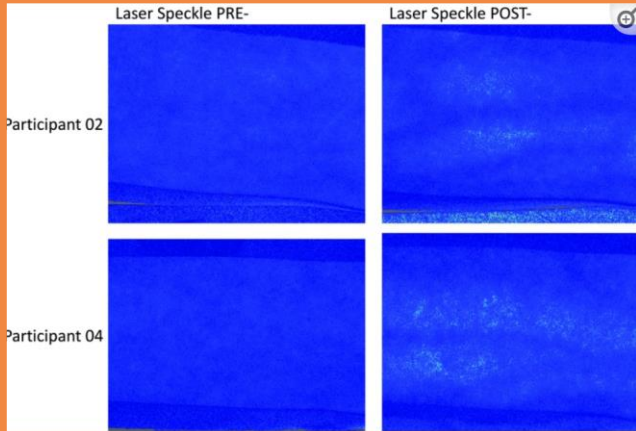
Effect on **local flow**: intramuscular and cutaneous blood flow

- No effect on heart rate
- Significant effect on **cutaneous temperature**



*Conclusion :*

**Significant increases compared to the placebo group could be observed in CET and RET both in cutaneous microcirculatory perfusion and in intramuscular blood circulation.**



Access the study:

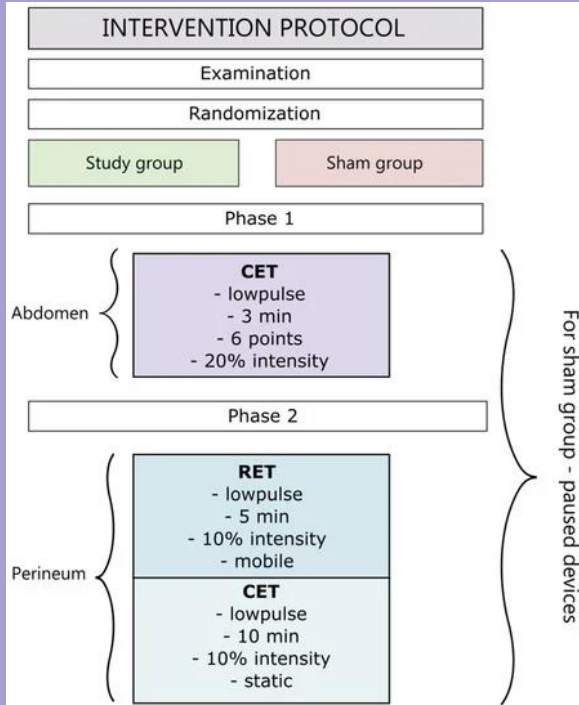


# 02

Pain Studies

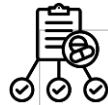


- › Double-blind
- › 121 middle-aged women
- › Paused device control group
- › Setting a thermal set before the exam



## PAIN STUDIES

### Using Capacitive and Resistive Energy Transfer in Postpartum Pain Management in Women After Perineal Trauma – Joanna Sierenska (2023)



Observed effects:

- **Reduced pain at rest and on walking**
- Significantly greater reduction in walking discomfort in the TECAR group compared to the control group ( $p < 0.05$ ).



*Conclusions: Limit duration study because very short-term effect*

This study showed that the use of high-frequency current therapy can have a positive effect on **reducing perineal pain and discomfort** in the first few days following vaginal delivery with perineal trauma.

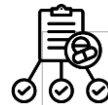
*Access the study:*



## Capacitive-Resistive Radiofrequency Therapy for Postpartum Perineal Pain: A Randomized Study

Florence Bretelle, Chantal Fabre, Marine Golka, Vanessa Pauly, Brimbelle Roth, Valérie Bechadergue, Julie Blanc (2019)

- › Double-blind
- › Either perineal tears or an episiotomy after vaginal delivery (with or without instrumental assistance)
- › Day 1 and Day 2 Post Partum



### Results:

- The primary outcome was **pain assessed at rest** using a visual analogue scale on D2. At rest, VAS>4 was observed in both the CT and EX groups.

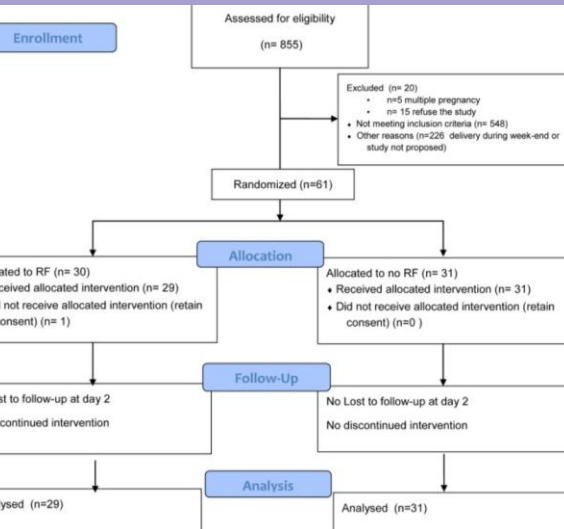
Secondary outcomes included:

- **on Day 2, discomfort and pain when walking and sitting**, the type of pain and taking painkillers.
- Resumption of sexual intercourse and pain from sexual intercourse were also assessed by phone call 30 days after delivery.



### Conclusion :

VAS>4 on day 2 was not different in the experimental and control groups, but when RF was associated **less perineal discomfort** when walking and **less consumption of paracetamol after delivery** was described in the Tecar group.



Access the study:



## Effects of Capacitive and Resistive Electrical Transfer Therapy on Pain, Stiffness, and Lumbar Muscle Activity in Patients With Chronic Low Back Pain Michio Wachi J Phys Ther Sci

- › Double-blind randomized clinical trial
- › 24 patients
- › Sham treatment
- › Chronic low back pain
- › 15 min: 5 CET+ 10 RET



### Conclusion :

- › Positive effect of TECAR in **reducing muscle pain and stiffness** in patients with chronic low back pain, with no immediate effect on increasing muscle activation levels during forward trunk flexion.

		Intervention group		Sham group	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
VAS (mm)		45.63 ± 23.52	9.38 ± 10.16*	47.22 ± 25.50	44.56 ± 29.42
Muscle stiffness	Superficial multifidus	8.84 ± 13.34	0.76 ± 0.54*	9.52 ± 8.96	10.02 ± 9.42
	Deep multifidus	13.74 ± 10.70	1.41 ± 1.21*	12.56 ± 14.90	12.56 ± 14.91
Muscle activity	CLT	1.16 ± 0.82	1.76 ± 2.45	1.25 ± 1.02	1.40 ± 1.42
	ICLL	2.19 ± 1.97	3.95 ± 7.15	2.54 ± 2.35	2.40 ± 2.81
	MF	2.99 ± 1.64	3.18 ± 2.11	3.51 ± 1.84	3.24 ± 2.14

Value are presented as the mean ± standard deviation. \*p<0.05, compared to pre-intervention value.

CRet: capacitive and resistive electric transfer; VAS: visual analog scale; ICLT: thoracic component of the iliocostalis lumborum; ICLL: lumbar component of the iliocostalis lumborum; MF: lumbar multifidus.

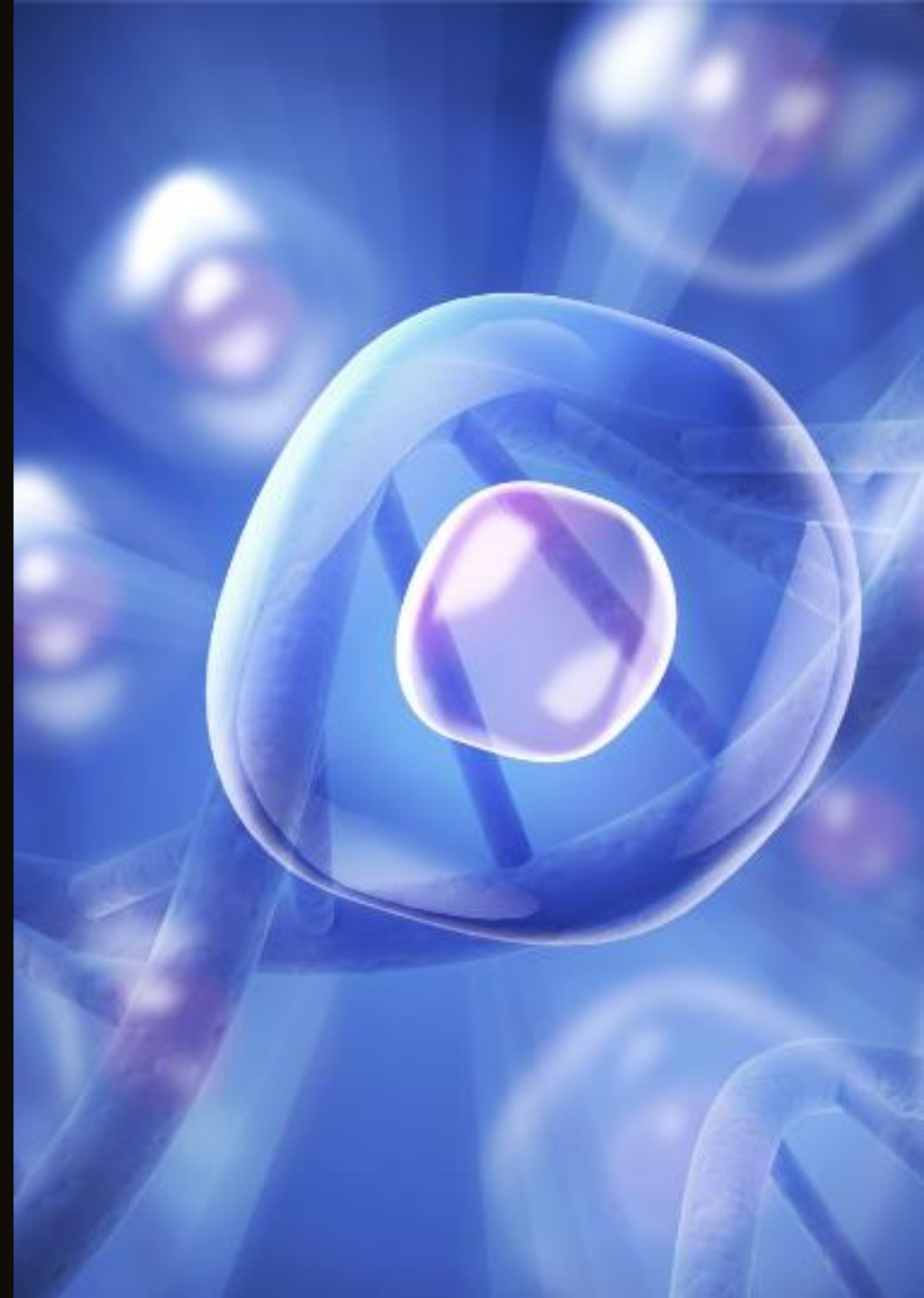
Access the study:





03

Studies on cellular  
effects



- › Human dermal fibroblasts
- › Human epidermal keratinocytes

In vitro radiofrequency current stimulation promotes the proliferation and migration of human keratinocytes and fibroblasts María Luisa Hernández-Bule *Electromagn Biol Med* July 3, 2021; 40(3):338-352



Conclusions:

TECAR current can **promote the proliferation of human fibroblasts** and **keratinocytes**, which are involved in regenerative effects.

The wound test did not detect an increase in migration rates in electrically treated keratinocytes

These present results suggest dual and simultaneous **tecar effects in skin cells: promotion of early fibroblast migration and slowing of keratinocyte migration**

Tecar electrostimulation could **promote normotrophic wound regeneration** by promoting the completion of granulation tissue formation before the closure of the outer tissue layers, thus **preventing wound chronification or abnormal healing**.

Access the study:



- › Fibroblast cell cultured in contact with sterile electrode
- › 5 min/4 hour for 12-24-48h

## Antifibrotic Effects of RF Electrical Currents María Luisa Hernández-Bule Int J Mol Sci (2023)



### Conclusions:

- 
- RF has an action on the extracellular matrix
- RF current leads to a decrease in pro-inflammatory transcription factors

*Access the study:*



Electrical currents at 448 kHz positively regulate anti-senescence pathways in human dermal fibroblasts

**Elena Toledano-Macías J Cosmet Dermatol (2024)**



Conclusions :

- › **Remodeling of the extracellular matrix** (depends on the type of signal applied and the physiological state of the target tissue)
- › The TECAR current could promote **tissue renewal** in the tissues targeted for therapy and could be of interest in **reducing the signs of skin ageing**.

- › Newborn fibroblast cells cultured and put in contact with sterile electrodes
- › 5 min/4 hour for 12-24-48h

*Access the study:*



04

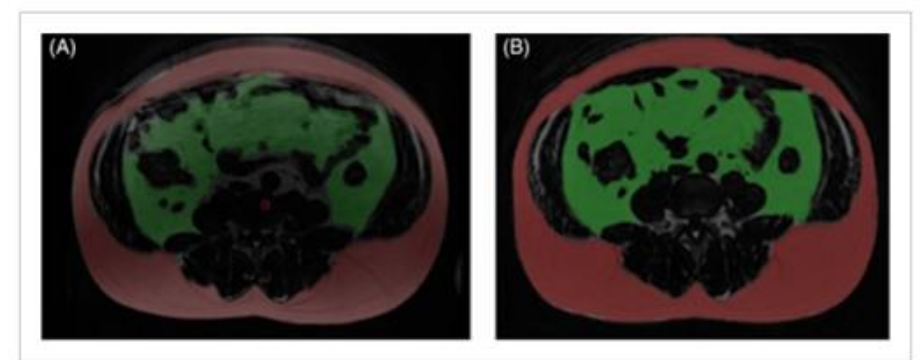
Studies on aesthetic effects



## Subcutaneous fat loss in 20 patients, of both sexes, using a second-generation 1,240 Watt TECAR device and results analyzed by Lastra magnetic resonance imaging (2024)



- Conclusion:
- Statistically significant effects on **waist circumference** and **subcutaneous fat** (frequency 1mhz)



Access the study:

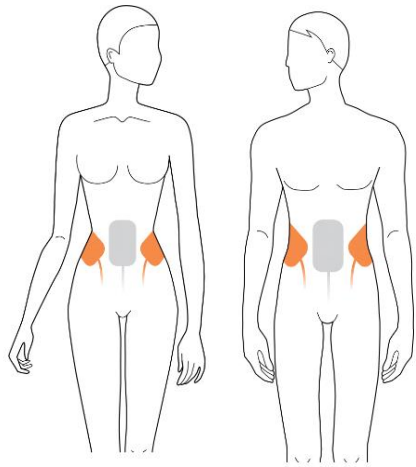


NEW WINBACK

# Care +

WINBACK

- › Combination of currents:
- › + **TECAR** Hyperthermia with action on the muscle/fat ratio
- + **Hi-EMS** Muscle stimulation/tetanization and drainage
- + **Hi-TENS** Skin tightening and analgesia



## HANDS-FREE PROTOCOLS with adhesive plates

› **Hyperthermia**



› **Muscle stimulation**



1 SESSION



7 SESSIONS



05

And the placebo effect?!





## Immediate Effects of TECAR Therapy on Gastrocnemius and Quadriceps Muscles with Spastic Hypertonia in Chronic Stroke Survivors: A Laura García-Rueda Randomized Controlled Trial (2023)

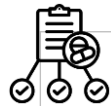
Inclusion:

Stroke +6 months

score of 1 to 3 points on the modified Ashworth scale (hip, knee, foot)

Method

Tecar and Heated Electrode Control Group



Comments:

The ankle dorsiflexion MAS score showed **statistically significant changes compared to the control group** between T0 and T1 ( $p = 0.046$ ) and between T0 and T2 ( $p = 0.019$ ).

No statistically significant changes were observed for hip flexion or knee flexion

The mas degrees for ankle dorsiflexion showed significant **improvements for the intergroup analysis between t2 and t0** ( $p = 0.011$ )"

In the intergroup PROM analysis of the gastrocnemius variable, **statistically significant differences were demonstrated between T2 and T0** ( $p = 0.034$ ). In the within-group analysis, a **significant improvement** was observed in the experimental group between T1 and T0 ( $p = 0.028$ ) and between T2 and T0 ( $p = 0.033$ )"



Conclusions:

**Positive and significant effect on ankle and knee mobility and decreased gastrocnemius and quadriceps tone**

Access the study:



## Effects of Deep Heat Therapy on Chest Wall Mobility in Healthy Older Women Tsubasa Bito (2020)

**Table 2.** The pre-post intervention difference within group.

	CRet (N = 10)		Hot pack (N = 9)		Sham (N = 8)	
	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Axillary excursion	1.81 ± 0.55(1.80)	2.31 ± 0.58(2.45)*	2.76 ± 0.87(2.80)	2.74 ± 0.82(2.70)	2.51 ± 1.51(1.85)	2.95 ± 1.86(2.00) <sup>†</sup>
Xiphoid excursion	2.63 ± 0.97(2.40)	3.19 ± 0.98(3.05)*	2.54 ± 1.31(2.50)	2.74 ± 1.17(2.50)	3.25 ± 1.85(3.1)	3.36 ± 2.01(3.15)
Tenth rib excursion	1.68 ± 0.93(1.65)	2.45 ± 0.70(2.40)*	2.07 ± 1.33(1.70)	2.76 ± 1.37(2.50)*	2.35 ± 0.87(2.15)	2.78 ± 1.00(2.45)
FVC (L)	2.37 ± 0.56(2.27)	2.38 ± 0.52(2.25)	2.37 ± 0.50(2.31)	2.37 ± 0.47(2.41)	2.55 ± 0.36(2.49)	2.47 ± 0.39(2.44)
FEV <sub>1</sub> (L)	1.85 ± 0.44(1.94)	1.84 ± 0.40(1.91)	1.87 ± 0.48(1.84)	1.84 ± 0.46(1.82)	1.96 ± 0.28(1.97)	1.96 ± 0.26(1.93)
ST (°C)	32.5 ± 0.83(32.3)	33.2 ± 0.93(33.4)	33.3 ± 1.02(33.1)	35.4 ± 0.46(35.4)*	32.3 ± 0.86(32.2)	31.5 ± 0.71(31.4)*
10 mm DT (°C)	34.0 ± 0.87(34.2)	36.8 ± 0.71(37.1)*	35.1 ± 0.95(35.5)	37.3 ± 0.29(37.3) <sup>†a</sup>	33.5 ± 1.06(33.7)	32.8 ± 0.90(32.8)
20 mm DT (°C)	34.0 ± 0.87(34.0)	37.6 ± 0.53(37.5) <sup>†a</sup>	34.9 ± 0.84(35.2)	37.4 ± 0.39(37.3)*	33.5 ± 1.07(33.5)	33.4 ± 0.97(33.1)

Mean ± SD (Median) \*:p < 0.05 vs pre intervention values

<sup>†</sup>Wilcoxon signed-rank test was used; CRet: Capacitive and Resistive electric transfer; FVC: Forced vital capacity; FEV<sub>1</sub>: Forced expiratory volume in one second; ST:Skin temperature; DT:Deep temperature.



Conclusions: TECAR may be one approach to **improving chest wall mobility.**

- › Methodology
- › Women divided into 3 groups:
  - **TECAR**
  - **Hot pack**
  - **Dummy device**

- › Measurement of:
  - › Vital capacity
  - › Temperature
  - › Mobility

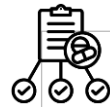
Access the study:



## PLACEBO EFFECTS STUDIES

# Acute Effects of Tecar Therapy on Skin Temperature, Ankle Mobility, and Hyperalgesia in Myofascial Pain Syndrome in Professional Basketball Players: A Mireia Yeste-Fabregat Pilot Study (2021)

- › 32 basketball players
- › Analysis:
- › Skin temperature
- › VAS
- › Ankle mobility



### Effects observed:

Significant effect on myofascial pain and a cutaneous thermal effect that increased with treatment, but no effect on amplitude (opposite effect of other studies)



### Conclusions:

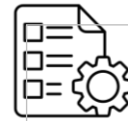
"According to our results, TECAR can induce **temperature changes** in the **medial gastrocnemius** in male professional basketball players, generating **an increase in local temperature** and a **decrease in local pain (VAS)** in the MTP after treatment. In addition, TECAR **does not affect the dorsal flexion range of the ankle.** »

Access the study:



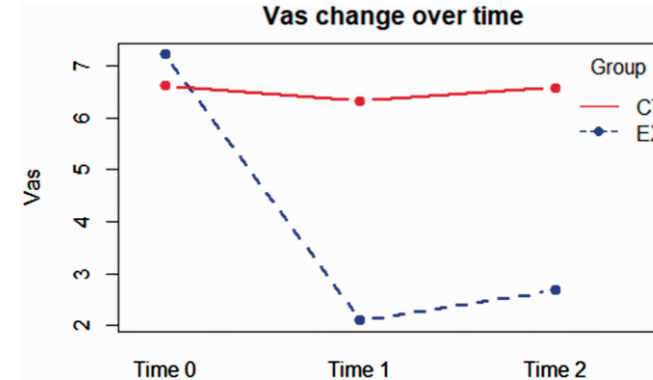
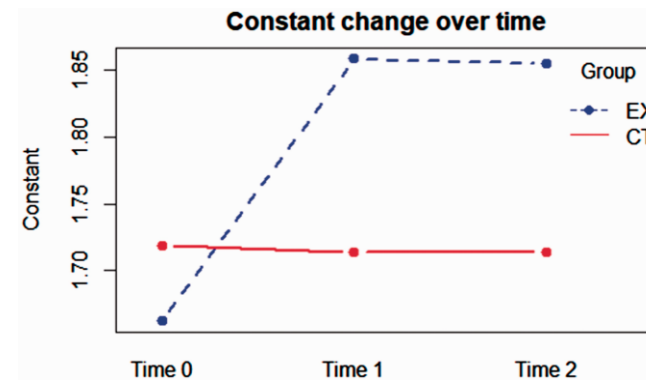
## Effects of TECAR therapy in patients with shoulder impingement syndrome: a comparative study Paolucci (2020)

- › **50 patients**
- › Inclusion criteria from 20 to 50 years old
- › a diagnosis of impingement syndrome (Neer's stage 2 or 3)
- › shoulder pain (visual analogue scale, VAS>3)



### Protocol and observations:

- Machine on / machine off
- Constant Score increases with Tecar Group
- VAS decreases for the Tecar group, while does not change for the CT group



Access the study:



Conclusions: TECAR is a **useful therapeutic option for the conservative management of shoulder pain** to restore painless and powerful movement of the shoulder joint, **and improves function and quality of life in patients** with shoulder impaction syndrome.

Case study:  
Hi-EMS & Hi-TENS currents combined  
with  
Dry needling in muscle rehabilitation

*Access the study:*



## 1. Experiment 1: Background

### What is Winback Hi-EMS current?

The Hi-EMS current is a **medium-frequency** current (between 1.5kHz and 4kHz) with low-frequency pulse trains (between 1.5 and 100Hz). The advantage of medium-frequency current is that it produces **pain-free muscle recruitment** and is therefore more intense than standard low-frequency EMS currents alone.

In order to observe the effects of the Hi-EMS current, we carried out 2 experiments measured under EMG ( **Mdurance** device) and ultrasound control.



## ➤ Hi-EMS CURRENT

Hi-EMS: Medium Frequency

**Action: electromyostimulation**

Focal

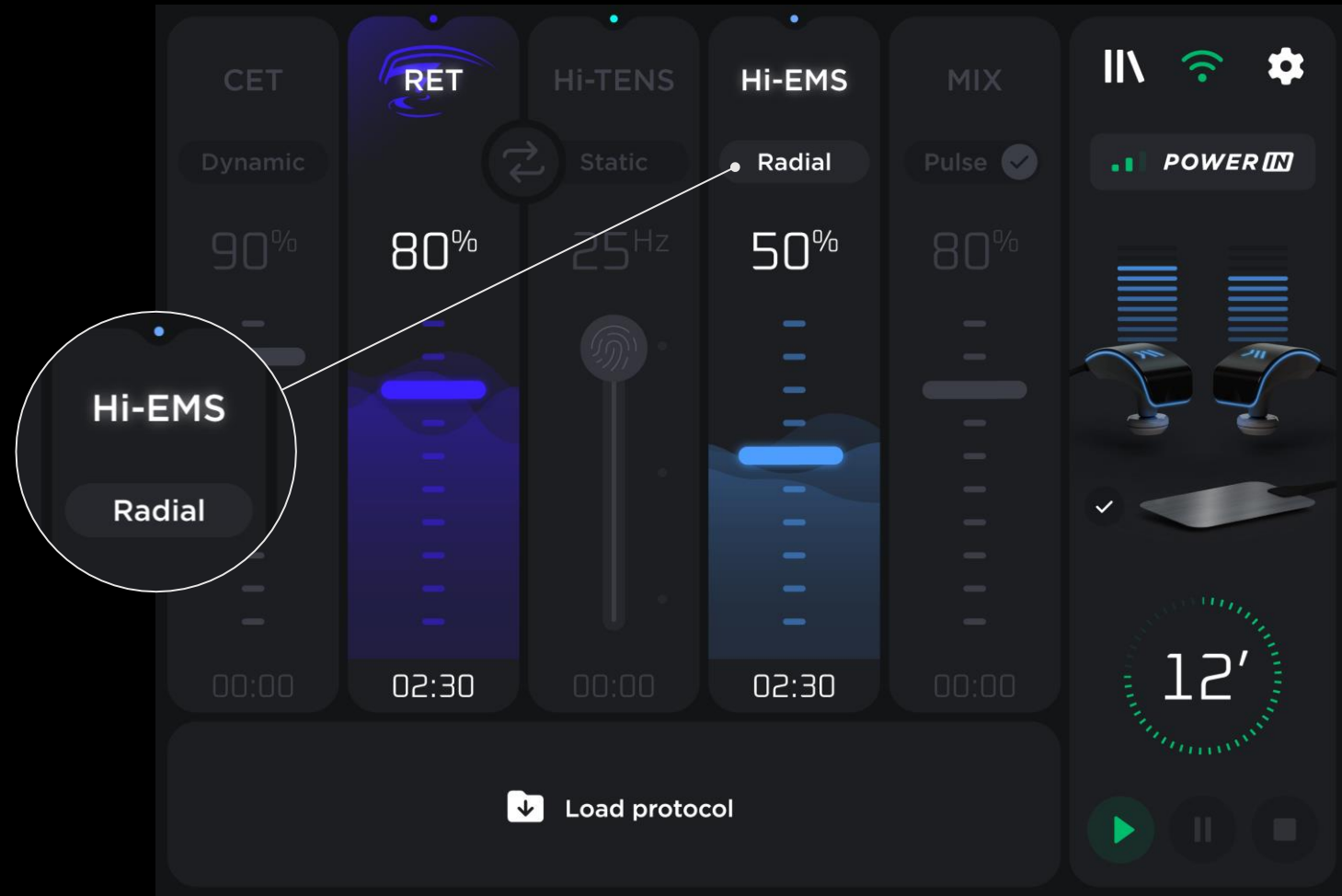
**1.5 kHz:** Recruits deep muscles

Drain

**4 kHz modulated to 3.5Hz & 50Hz:** Accelerated drainage

Radial

**4 kHz:** drainage, pumping and vascularization



## 1. Hi-EMS Radial Experience



### OBJECTIVE

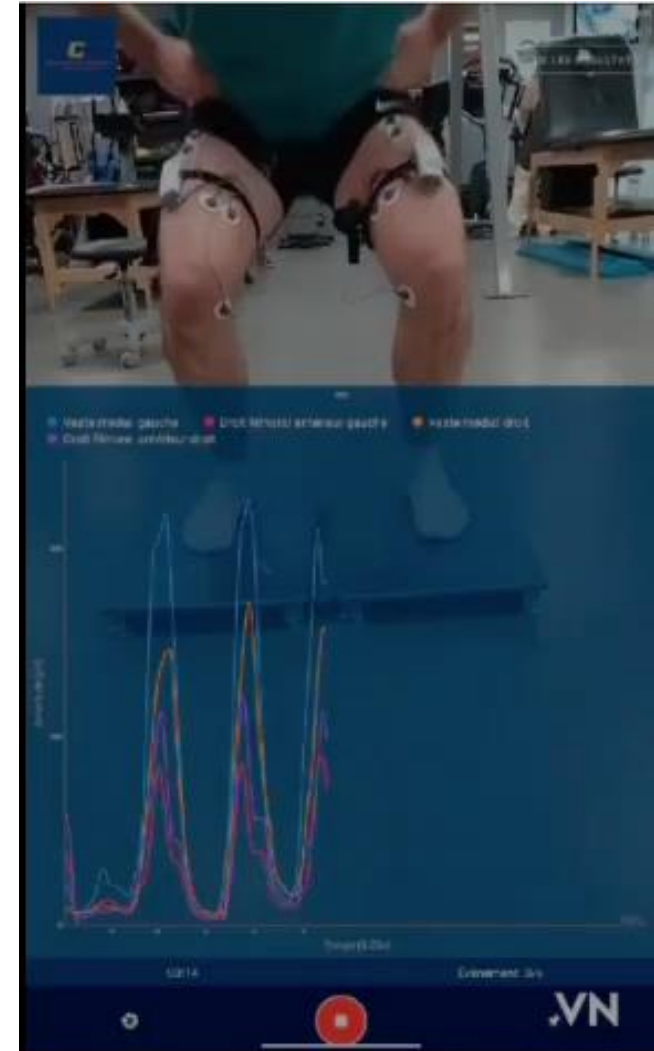
To compare the level of activation of the muscle fibers of the vastus medialis and the rectus femoris during a squat

To compare the level of activation of muscle fibers in the vastus medialis and rectus femoris during an isometric contraction (knee in extension).

To compare the level of activation of the muscle fibers of the vastus medialis and rectus femoris by stimulating the femoral nerve and the muscle heads of the vastus medialis and rectus femoris.

Observing the impact of HiEMS current on muscle recruitment in a patient with a total ACL rupture

Hi-EMS stimulation is transmitted directly by dry-needling needles previously introduced under ultrasound control.



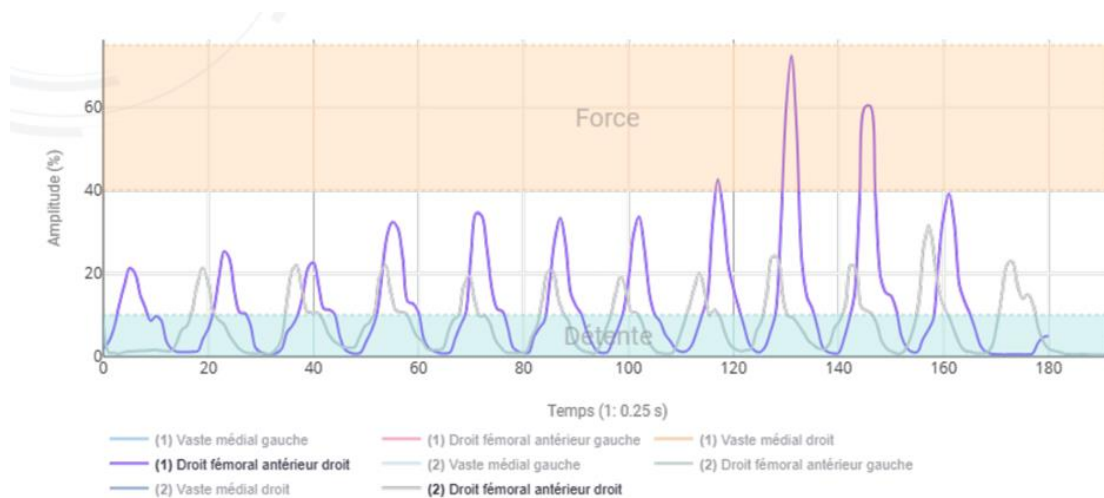


## 1. Hi-EMS Radial Experience



### OBSERVATIONS

Radial Hi-EMS stimulations on the femoral nerve and the motor branch of the vastus medialis could be observed under ultrasound control.



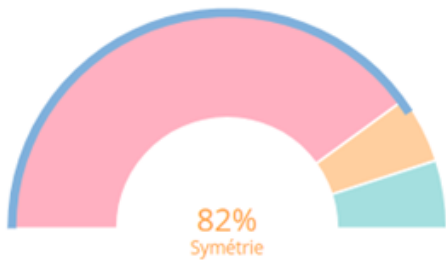
## 1. Hi-EMS Radial Experience



### RESULTS

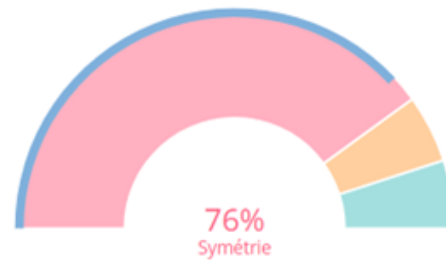
Stimulation with 10% radial HiEMS results in a higher level of activation (% of MVIC Maximum Voluntary Isometric Contraction) than any other exercise (squat, isometric or knee extension)

(2) Indices de symétrie musculaire



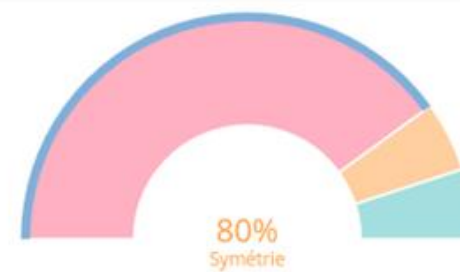
■ Asymétrie  
■ Limite  
■ Normal  
■ Droit fémoral antérieur droit  
■ Droit fémoral antérieur gauche  
■ Tableau d'affichage

(2) Indices de symétrie musculaire



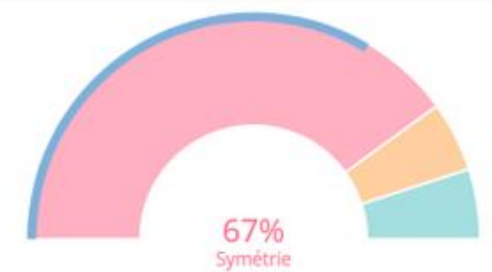
■ Asymétrie  
■ Limite  
■ Normal  
■ Vaste médial droit  
■ Vaste médial gauche  
■ Tableau d'affichage

(1) Indices de symétrie musculaire



■ Asymétrie  
■ Limite  
■ Normal  
■ Droit fémoral antérieur droit  
■ Droit fémoral antérieur gauche  
■ Tableau d'affichage

(1) Indices de symétrie musculaire



■ Asymétrie  
■ Limite  
■ Normal  
■ Vaste médial droit  
■ Vaste médial gauche  
■ Tableau d'affichage

## »» 2. Expérience 2: Contexte

### What is the Winback Hi-TENS current?

The HiTENS current is a **high-frequency current (0.3MHz) pulsed at low frequency (2, 5 and 25Hz)** to obtain a powerful analgesic effect by saturating the nociceptors and regular muscular twitches (isolated contractions) corresponding to the frequency of the pulses.



## 2. Hi-TENS Experience



### OBJECTIVE

To assess the impact of radial Hi-EMS stimulation on **activation of the rectus femoris.**

To do this, we used EMG to measure the **level of activation and synchronization of muscle fibers in the vastus medialis and rectus femoris** (right and left) during a **squat** movement.

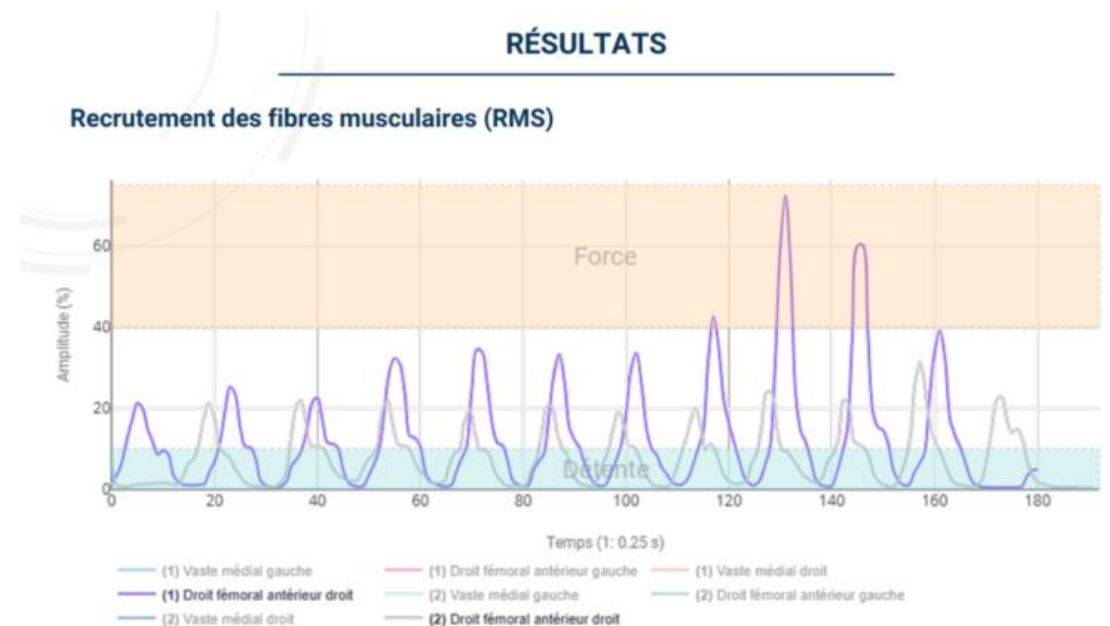


Comparison before and after Hi-EMS stimulation showed **improved activation of the vastus medialis after treatment.**

**+9% symmetry of activation** in the squat movement.

**Recruitment of the vastus medialis increased from 67% to 76%** symmetry after stimulation.

Increased activation of the left rectus femoris (untreated), demonstrating the cross-action of stimulation as described in the literature on neuromodulation treatment.



## 2. Hi-TENS Experience



### OBJECTIVE

- › Observe the effects of the Hi-TENS current on **trigger point** release (decrease in neuromuscular activity)
- › To determine the **possibility of decreasing neuromuscular activity** by acting directly on a trigger point by transmitting the HiTENS 5Hz current via a dry needling needle.



## 2. Hi-TENS Experience



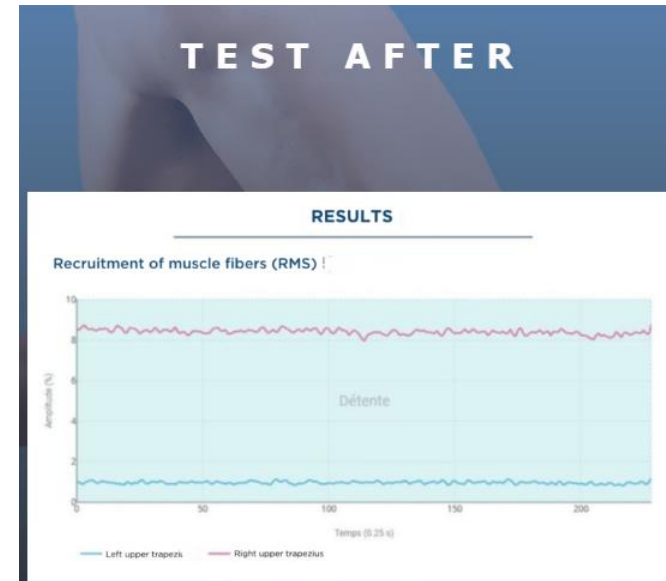
### OBSERVATIONS

- › We have previously (the day before) asked the patient to perform **pre-fatigue work on Dumbbell Shrug** until failure at the level of the upper trapezius. The next day, we measured the resting neuromuscular activity (basic tone) of the right and left upper trapezius.



Stimulation with the 5 Hz Hi-TENS current was **performed directly in the trigger point of the right upper trapezius**, after introducing the dry needling needle under ultrasound control.

**Resting neuromuscular activity** was again observed after Hi-TENS stimulation using EMG.



**Very clear reduction in basic tone**, allowing the patient to return to the relaxation zone.

The tone of the right upper trapezius remains slightly higher than on the contralateral side, but this is normal as it is the dominant limb.

→ **Significantly reduced activity after HiTENS 5Hz treatment of less than a minute, allowing the patient to return to normal (relaxation).**

## »» Conclusion of the 2 experiments



### INTERPRETATION OF RESULTS

These experiments enabled us to highlight the **activation capacity of the Hi-EMS current, which is superior to voluntary exercise**, and also the **possibility of improving activation symmetry**.

- This leads us to believe that the Hi-EMS current could be used **post-operatively** to relieve sideration or during rehabilitation to improve muscle activation.

As far as the **Hi-TENS** current is concerned, these experiments are very promising as regards its use in the case of **trigger points** to **regulate neuromuscular activity** to make these trigger points yield.



**WINBACK**

BETTER FASTER GENTLER