(Place your scripture, quote or photo here, i.e.)

"Do not be conformed to the pattern of this world,
but be transformed by the renewing of your mind
That you may be able to test and approve
what the will of God is,
his good, pleasing, and perfect will."

-Romans 12:2

Introduction to Rehabilitation Therapy

Britt Carr Benson, DVM, DACVSMR, CCRT

Diplomate of the American College of Veterinary Sports Medicine and Rehabilitation

Certified Canine Rehabilitation Therapist

CVM Veterinary Conference

ROMANS 12:2

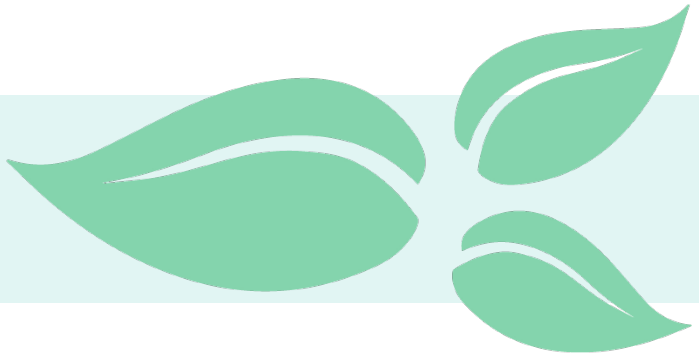
TRANSFORMED

Acknowledgements

- Christian Veterinary Mission

CVM Veterinary Conference

Relevant Disclosures



- I am a consultant for Companion Animal Health

Frequently Asked Question...

"Dr. Carr Benson, I know what you do over in Rehab...

but what do you ***actually*** do??"

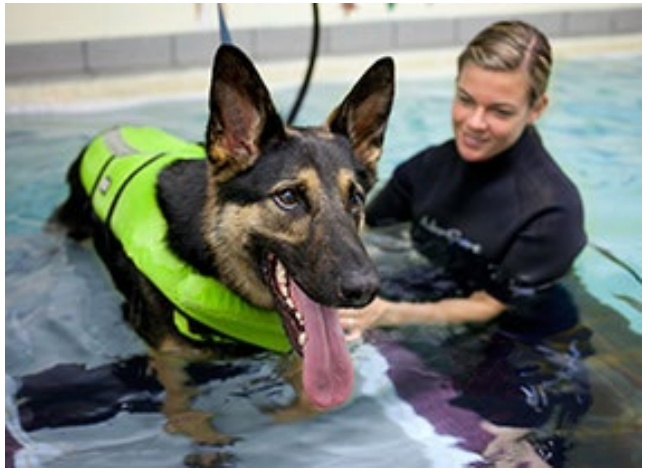
Veterinary Rehabilitation Therapist

What my friends think I do

What my mom thinks I do

What my boss thinks I do

What clients think I do



What I think I do

What I actually do

What is Canine Rehabilitation Therapy?

- Veterinary Physical Rehabilitation – the use of non invasive techniques (excluding Veterinary Chiropractic) for the rehabilitation of injuries in non human animals

- Physical Therapy– protected terms in United States

- Physiotherapy – protected term in Canada and United Kingdom

Goals of Canine Rehabilitation Therapy

- Decrease pain and facilitate healing
- Maintain normal range of motion in affected joints.
- Prevent soft tissue contracture and fibrosis in weak or paralyzed limbs
- Prevent further disuse atrophy during the healing process
- Improve strength and function of affected limbs
- Maximize post-surgical recovery and return to function of the patient.
- Provide positive psychological effects for the patient and owner.

Rehabilitation Consultation Exam
Reasons For Referral

- Performance Issues/Conditioning
- Post Surgical
- Soft Tissue Trauma
- Neurological
- Orthopedic Disease
- Combination thereof

What to expect at an initial consultation

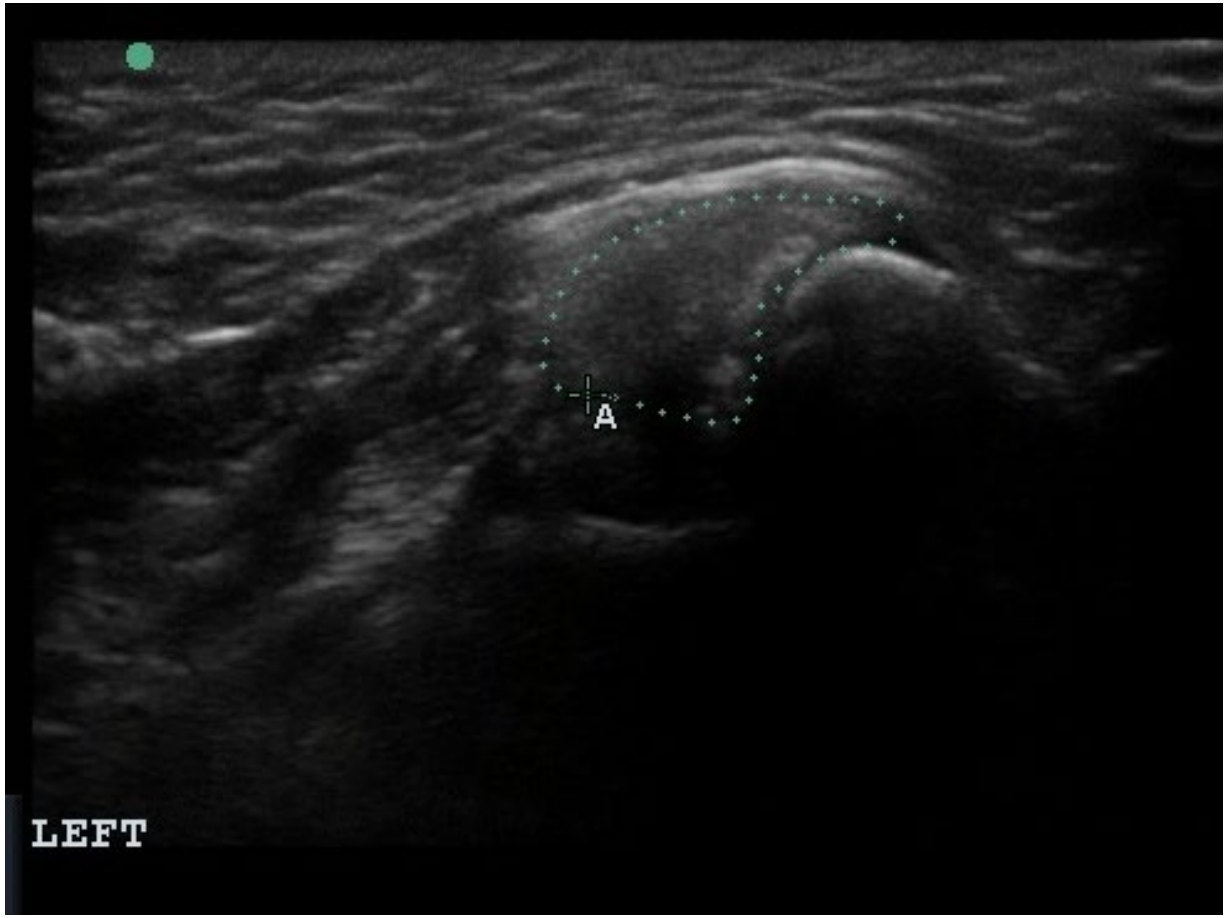
- History
- Examination
  - Gait Analysis
  - Objective Measures when possible
- +/- Diagnostics
- Discuss Diagnosis and Assessment of Patient
- Discuss Goals for the Patient
- Discuss Rehabilitation Therapy Plan and Home Care Plan
- Discuss Reasonable Expectations and Answer Questions

History

- Signalment
- Patient's Job
- Medications
- Things they've tried
- Their Goals
- Concurrent Medical Problems
  - Seizures
  - Neoplasia
  - Heart Condition/Pacemaker

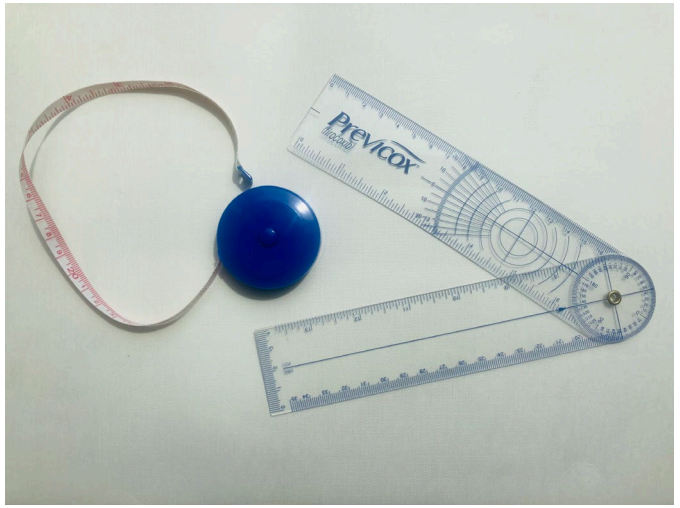
Examination and Diagnostics

- Neurological Exam
  - Deficits
- Orthopedic Exam
  - Goniometry
  - Muscle Circumference
- Lameness Exam
  - Gait Analysis
- Imaging
  - Radiographs
  - Diagnostic MSK US
  - MRI/CT



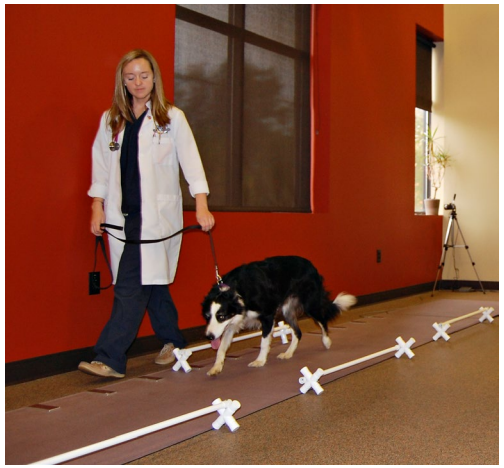
Objective Assessment Measures

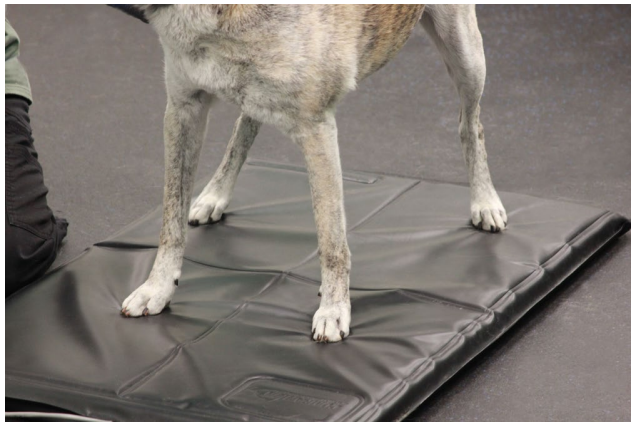
- Gait Analysis
- Goniometry
- Thigh Circumference
- Validated Client Survey



Gait Analysis

- Subjective
  - Visual Analogue Scale
  - Numerical Rating Scale
- Objective
  - Weight bearing at stance
  - Temporospatial
  - Kinetic
  - Kinematic





Goniometry

Joint	Position	Mean	SD	95% CI of the mean	Median
Carpus	Flexion	32	2	31–34	32
	Extension	196	2	194–197	196
	Valgus	12	2	11–13	12
	Varus	7	1	6–8	7
Elbow	Flexion	36	2	34–38	36
	Extension	165	2	164–167	166
Shoulder	Flexion	57	2	54–59	57
	Extension	165	2	164–167	165
Tarsus	Flexion	39	2	37–40	38
	Extension	164	2	162–166	165
Stifle	Flexion	42	2	40–43	41
	Extension	162	3	160–164	162
Hip	Flexion	50	2	48–52	50
	Extension	162	3	160–164	162

CI = Confidence interval.

AJVR, Vol 63, No. 7, July 2002

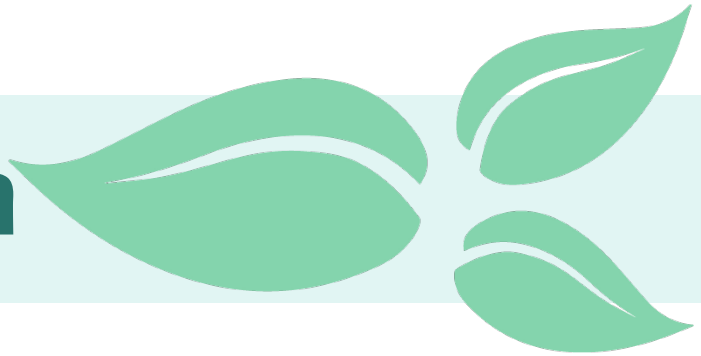
Jaeggerr AJVR 2022.

Muscle Circumference

Validated Client Surveys for Pain and QOL

- Canine Brief Pain Inventory (CBPI)
- Helsinki Chronic Pain Index (HCPI)
- Canine Orthopedic Index (COI)
- Liverpool Osteoarthritis in Dogs (LOAD)
- Visual Analogue Scale (VAS)
- Glasgow Composite Measure Pain Scale Short Form (CMPS-SF)
- Canine Health Related Quality of Life Survey-21 (CHQLS-21)
- Canine Osteoarthritis Staging Tool (COAST)

Rehabilitation Therapy Plan

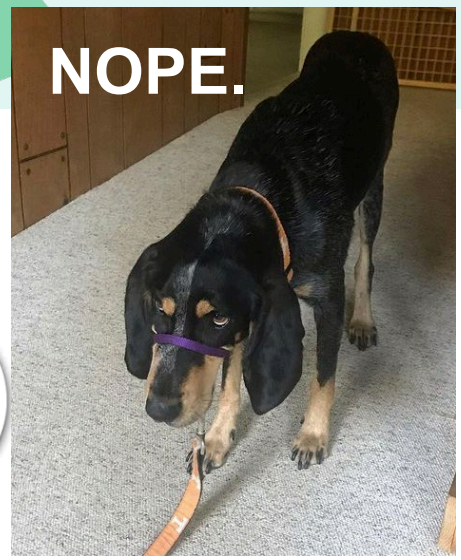


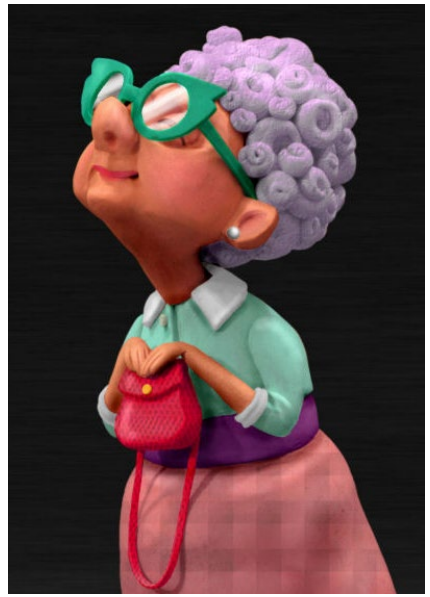
- Rehabilitation Therapy should be used as part of a multimodal management strategy
- Typically the plan changes over the course of treatment
  - Reassess patient and goals every 4-6 weeks
- May recommend in clinic sessions 1-3 times weekly
- Sessions are anywhere from 30-60 min long
- Every patient has a home exercise plan

Rehabilitation Therapy Plan

- Made with your Diagnosis and Goal in mind

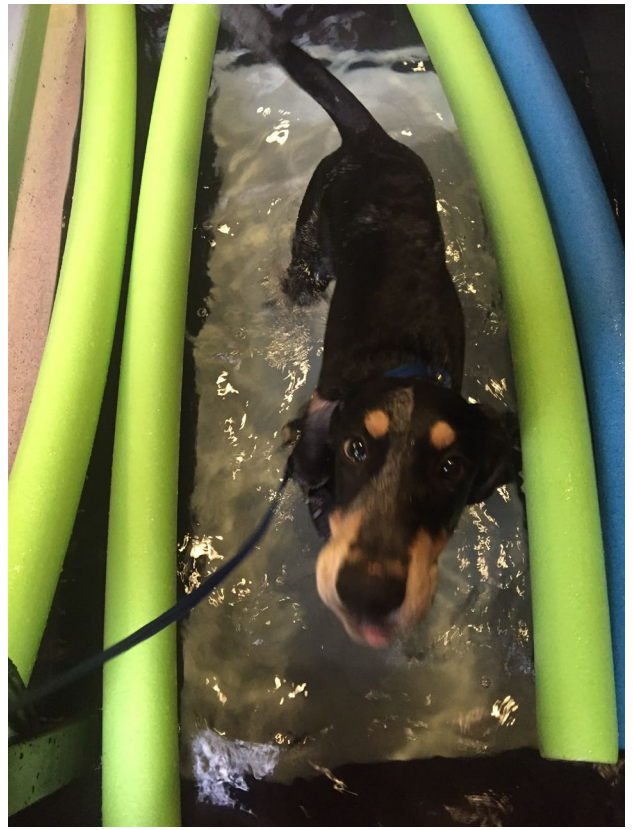
- What Modalities and Home Recommendations??
  - Patient Factors
  - Owner Factors



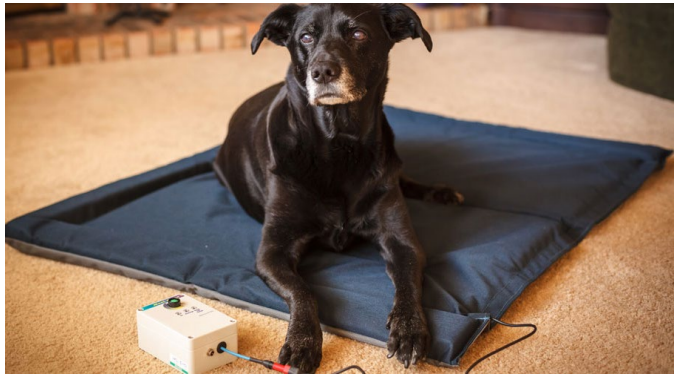


Rehabilitation Therapy Plan

- Things owners like to prepare for:
  - Gel
  - Shaving
  - Water
  - Treating



Treatment Session

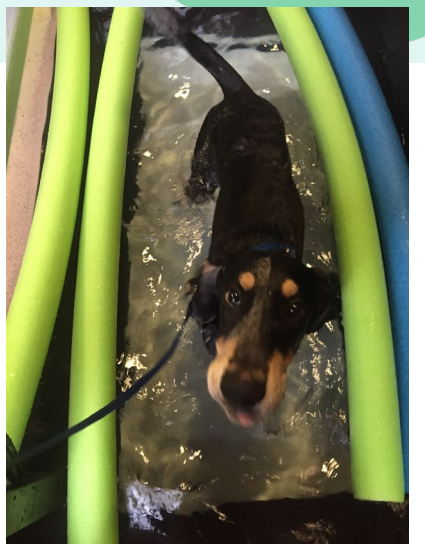


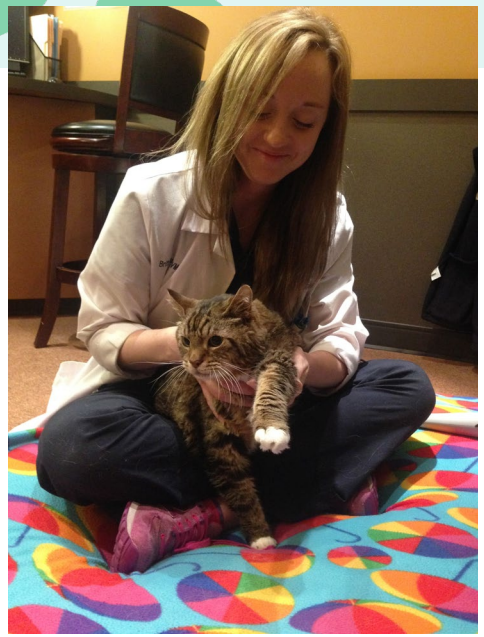
https://respondsystems.com/pemf/

- Quiet/Relaxing
- Owner Present
- Orthopedic Cushion/Mat
- Treats/Positive Reinforcement
- Pulsed Electromagnetic Field Therapy Bed

Physical Rehabilitation Modalities

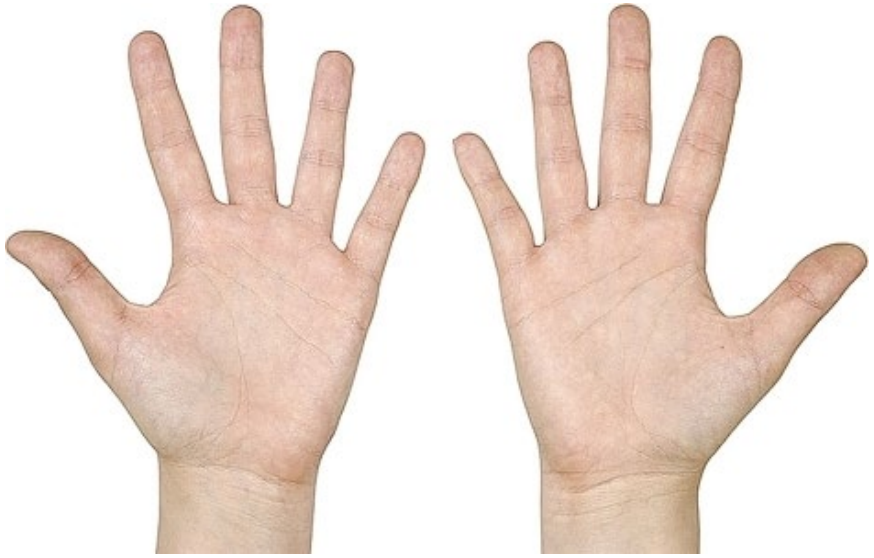
- Manual Therapy
- Cold Laser Therapy
- Therapeutic Ultrasound
- NMES
- TENS
- Pulsed Magnetic Field
- Cryotherapy
- Thermal Therapy
- Underwater Treadmill
- Deep Water Therapy/Swimming





What you need to be successful as a Rehabilitation Therapist...

+



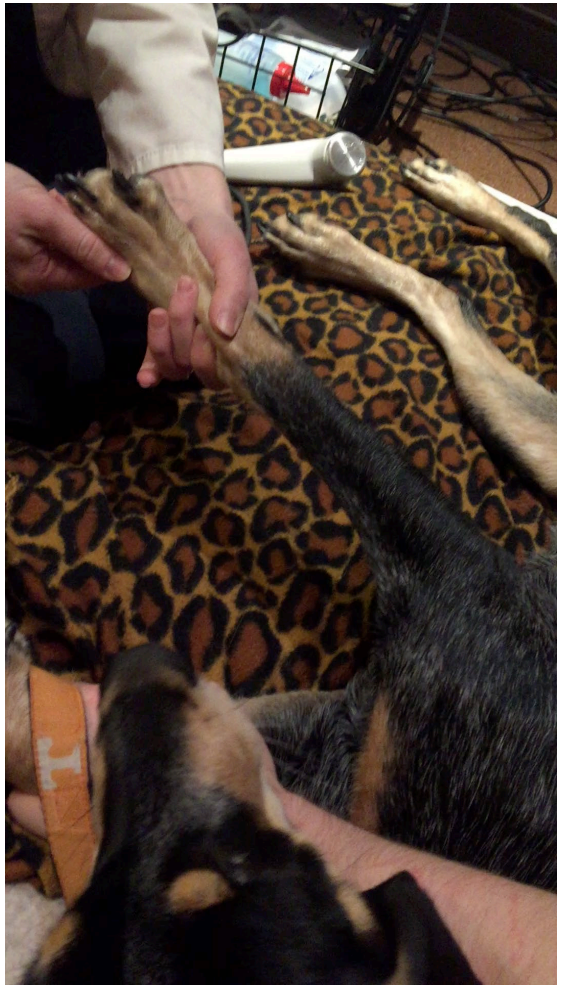
Manual/Massage Therapy

Manual/Massage Therapy: Goals

- Decrease swelling
- Increase tissue extensibility
- Prevent/reduce adhesion formation
- Increase ROM
- Increase flexibility
- Promote healing
- Reduce pain

Manual Therapy: Categories

- Massage
- Soft Tissue Mobilization
- Joint Mobilization
- Passive Range of Motion
- Stretching



Low Level Laser Therapy (LLLT)

Light Amplification by Stimulated Emission of Radiation

- Class 1 <0.5mW no heating, no healing, visible and non-visible, used for some pointers, car entry and remotes
- Class 2 <1mW visible, non-heating/healing
- Class 3a 1mW to 5mW, eye caution
- **Class 3b 5mW to 500mW (Many Therapeutic lasers) $$**
  - **Healing, target tissue depends upon the wavelength (600-1000 nm)**
  - **Most research based on Class 3b**
  - **Eye Danger**
- **Class 4 lasers - traditionally "cutting", "surgical", "hot" lasers >500mW, now includes therapeutic lasers, $$$$**

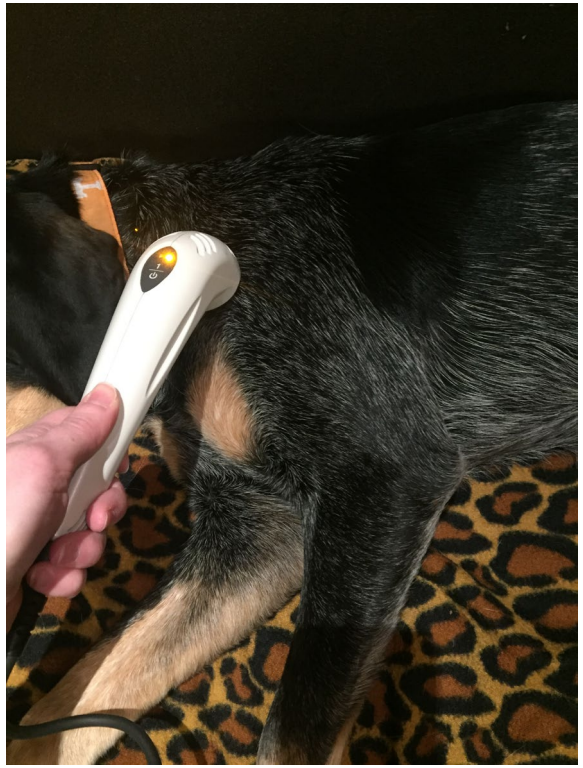
Low Level Laser Therapy (LLLT)

- Use of light energy to affect underlying tissues
- Influence lymph, circulation, nervous system and aids wound/surgery healing
- Therapeutic window 600-1000nm (visable and infrared)

Ghamsari SM, Vet Surg: 1997; 26: 114-120.,
Dyson,M. Proceedings of 1st International Symposium on Rehabilitation and Physical Therapy in Veterinary Medicine, Aug 1999

LLLT: Biological Effects

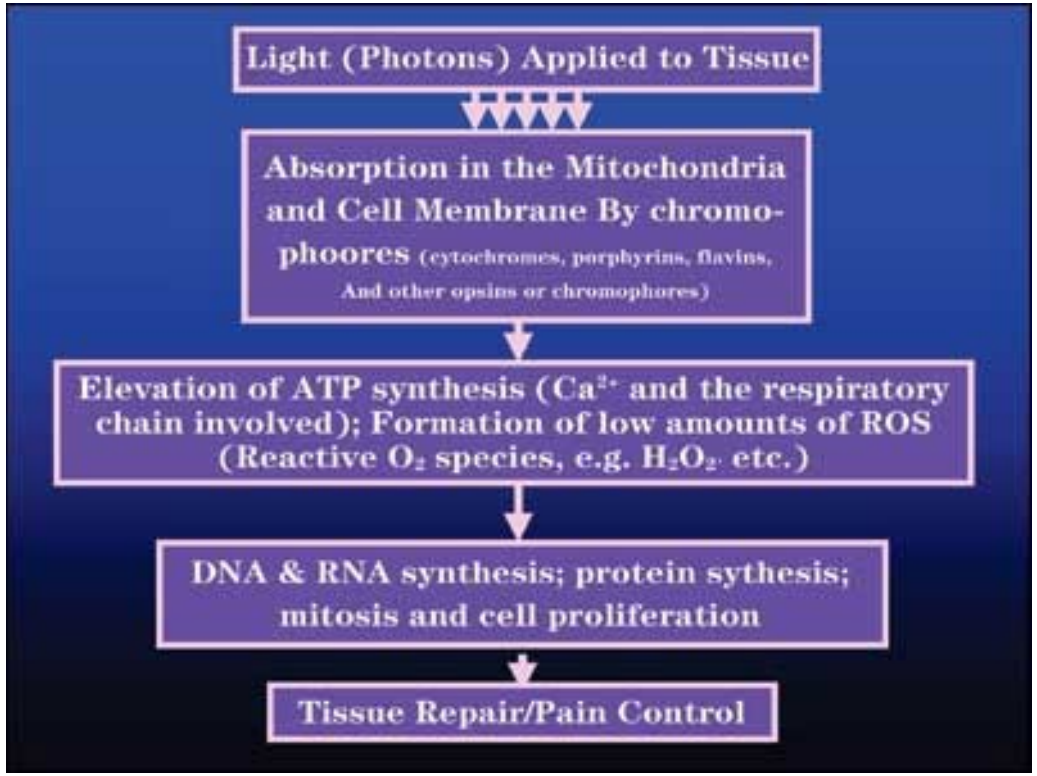
- Accelerates inflammation stage of wound healing
- Enhances immune cells to combat invading pathogens
- Decrease in micro-organisms
- Increases vascularity of healing tissue
- Pain reduction due to endorphin release
- Fibroblast production
- Cartilage Stimulation
- Acceleration of collagen synthesis



U. Oron, Circulation. 93: 296-301.2001

LLLT: Physiologic Effects

- Changes cell membrane permeability
- Increase ATP levels
- Increase cellular proliferation
- Increase collagen synthesis
- Increase myofibroblast activity
- Alters Pain Threshold



Dyson,M. Proceedings of 1st International Symposium on Rehabilitation and Physical Therapy in Veterinary Medicine, Aug 1999
Edge-Hughes, L. Canine Rehabilitation Program Module Two Program Design, April 2005

PhotoBioModulation (PBM)

Defined:

- Light exciting or activating cells
- Using light to produce beneficial effects on animals

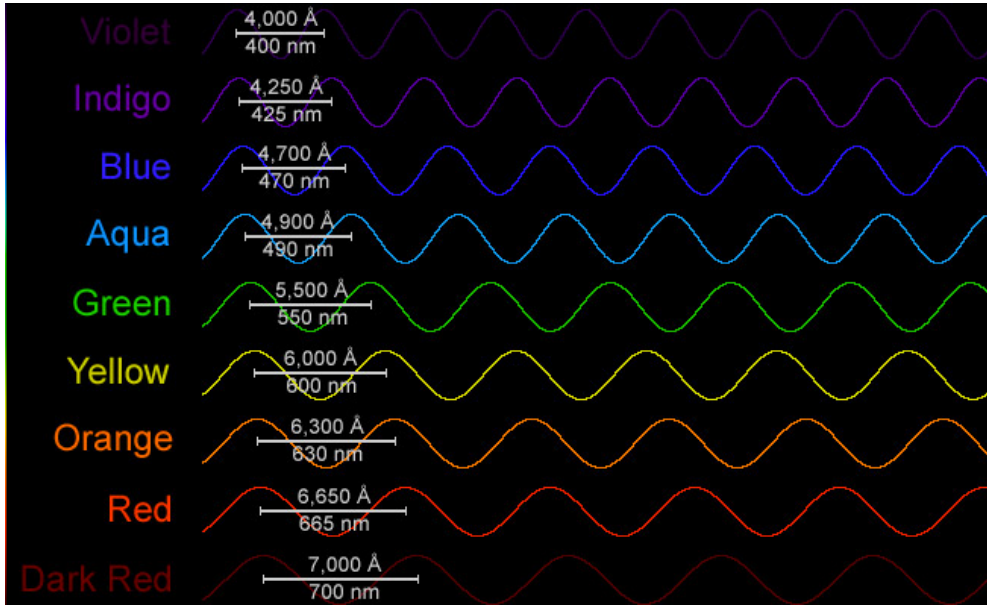
Assumptions:

- Absorption of AT LEAST ONE PHOTON by Mitochondrial chromophores is REQUIRED to initiate the PBM cascade
- Mitochondria chromophores absorb light throughout the visible and Near-Infra-Red (NIR) Spectrum
- Mitochondria of different cells, e.g., neurons, glia, fibroblasts, muscle, etc., ALL HAVE the same “initial response” to a photon absorption

Light/Laser Therapy

- Wavelengths of light (nm)
  - Determine potential depth of penetration into tissue
  - 800nm
    - < scatters into tissue
    - > absorbs➔heat
- Cells have unique light absorption wavelengths

Visible Light



Infrared Spectrum

800-1000nm

Randy Russell. Multispectrum of Energy.

Therapeutic Wavelengths:

Defines the range of wavelengths where light has its maximum depth of penetration in tissue

Skin (600-700nm)
Connective tissue (700-800nm)
Muscle and spinal cord (750-850nm)
Blood (800-900nm)
Nerves (900-1100nm)

Wavelength pre-determines depth and target tissue penetration

Kimberly R. Byrnes, Ronald W. Waynant, Ilko K. Ilev, Xingjia Wu, Lauren Barna, Kimberly Smith, Reed Heckert, Heather Gerst, and Juanita J. Anders. Light Promotes Regeneration and Functional Recovery and Alters the Immune Response after Spinal Cord Injury. Lasers in Surgery and Medicine 36:171-185 (2005)

A randomized blind placebo-controlled trial investigating the effects of photobiomodulation therapy (PBMT) on canine elbow osteoarthritis

Andrea L. Looney, Janice L. Huntingford, Lauren L. Blaeser, Sabine Mann

- RCT in 20 dogs with naturally occurring elbow OA
- The effect of PBMT (10-20 J/cm^2 x 6 weeks) VS sham light therapy on pain, nonsteroidal anti-inflammatory drug (NSAID) requirement, and lameness
- Lameness score, pain score, and NSAID dose were recorded by blinded study personnel before and 7-10 days after last treatment.
- Significant reduction in NSAID dose occurred in 9/11 dogs in the PBMT group and in 0/9 of group S dogs
- Significant greater improvement in lameness score post PMBT *vs.* S group.
- A greater reduction in pain score was detected in 9/11 parameters in group PBMT (P = 0.05).

Looney AL, Huntingford JL, Blaeser LJ, Mann S. *Can Vet J* 2018.

A randomized double-blinded controlled trial on the effects of photobiomodulation therapy in dogs with osteoarthritis

João C. Alves, DVM, MSc, PhD[1,2*]; Ana Santos, DVM, MSc[1]; Patrícia Jorge, DVM[1]; L. Miguel Carreira, DVM, PhD[3,4,5]

- 20 Dogs with bilateral moderate or severe hip OA
- Control Group
  - Metacam
  - Sham Laser Treatments
- PBMT Group
  - Placebo Pill
  - Week 1: 3 sessions, Week 2: 2 sessions, Week 3: 1 session

A randomized double-blinded controlled trial on the effects of photobiomodulation therapy in dogs with osteoarthritis

João C. Alves, DVM, MSc, PhD[1,2*]; Ana Santos, DVM, MSc[1]; Patrícia Jorge, DVM[1]; L. Miguel Carreira, DVM, PhD[3,4,5]

Table 1—Photobiomodulation therapy treatment parameters.

Light parameters (dose)		Notes
Wavelength (nm)	980 (for patients with dark coat color) 980/808 blend (for patients with light to medium coat color)	Blend consists of 80% of 980 nm and 20% of 808 nm
Radiant Power (W)	6.5–8	
Irradiance (W/cm^2) at skin surface	4.2–5.2	Depending on patient size, with smaller/thinner patients being treated at lower power; irradiance increased with increase in power
Fluence (J/cm^2)	14.3–19.5 (average over treated area)	
Treatment Protocol	Continuously moving grid pattern in contact over the area of the greater trochanter at a speed of 2.5–7.5 cm/s, according to manufacturer recommendations	
Treatment Area (cm^2)	225	
Treatment Time	Between 4 min, 35 s to 5 min, 5 s	

A randomized double-blinded controlled trial on the effects of photobiomodulation therapy in dogs with osteoarthritis

João C. Alves, DVM, MSc, PhD[1,2*]; Ana Santos, DVM, MSc[1]; Patrícia Jorge, DVM[1]; L. Miguel Carreira, DVM, PhD[3,4,5]

- Significantly better results were observed in PBMT at:
  - +8 days for pain score, function, and Canine Orthopedic Index (COI)
  - +15 days for pain score, function, COI, Liverpool Osteoarthritis in Dogs (LOAD), and joint range of motion
  - +30 days for function and gait, COI, pain scores, LOAD, and joint range of motion
- Kaplan-Meier estimators showed that PBMT produced longer periods with better results

Retrospective Observational Study and Analysis of Two Different Photobiomodulation Therapy Protocols Combined with Rehabilitation Therapy as Therapeutic Interventions for Canine Degenerative Myelopathy

Lisa A. Miller, DVM, CCRT, CVA,[1] Debbie (Gross) Torraca, DPT, MSPT, OCS, CCRP,[2] and Luis De Taboada, MSEE[1]

- Clinical records of dogs referred for presumed DM to a specialty rehabilitation facility were screened for patients meeting study criteria.
- Qualifying patients were divided into two groups: Protocol A (PTCL-A) and Protocol B (PTCL-B) group, based on the PBMt protocol used.

Retrospective Observational Study and Analysis of Two Different Photobiomodulation Therapy Protocols Combined with Rehabilitation Therapy as Therapeutic Interventions for Canine Degenerative Myelopathy

TABLE 2. PROTOCOL-A AND PROTOCOL-B GROUP PHOTOBIOMODULATION THERAPY TREATMENT PARAMETERS

	PTCL-A group	*PTCL-B group*
Light parameters (dose)		
Wavelength (nm)	904	980
Radiant power (W)	0.5	6–12[a]
Irradiance (W/cm^2) at skin surface	0.5	1.2–2.4[a]
Fluence (J/cm^2)	8 (per ''point'')	14–21 (average over treated area)
Treatment protocol	Point-to-point ''grid method'' technique at a total of 20 points spread throughout the treatment area according to manufacturer's instructions[b]	Continuously moving grid pattern over the entire treatment area at a speed of 1–3 in/sec according to manufacturer's recommendations[c]
Treatment area (cm^2)	650–1000[d]	650–1000[d]
Treatment time	~5 min, 20 sec	Between 25–26 min, 15 sec[a]

[a]Depending on patient's size, larger patients treated at higher power; irradiance increased with increase in power.
[b]Respond Model 2400XL Laser, Respond Systems, Inc., Branford, CT.
[c]Companion Therapy Laser CTC-15, LiteCure, LLC, DE.
[d]Treatment area increased with larger patient size.
PTCL-A, Protocol A; PTCL-B, Protocol B.

Retrospective Observational Study and Analysis of Two Different Photobiomodulation Therapy Protocols Combined with Rehabilitation Therapy as Therapeutic Interventions for Canine Degenerative Myelopathy

Lisa A. Miller, DVM, CCRT, CVA,[1] Debbie (Gross) Torraca, DPT, MSPT, OCS, CCRP,[2] and Luis De Taboada, MSEE[1]

- The times between symptom onset and euthanasia of dogs in the PTCL-B group (~38month) were significantly longer than those of dogs in the PTCL-A group (~11 months).
- The times between symptom onset and nonambulatory paresis (NAP) or paralysis of dogs in the PTCL-B group (~32 months) were significantly longer than those of dogs in the PTCL-A group (~9 months).
- Kaplan–Meier survival analysis showed that the times from symptom onset to NAP of dogs in the PTCL-B group were significantly longer than those of dogs in the PTCL-A group or the historical data group.

LLLT: Contraindications

- Epiphyseal Plates
- Injection Areas
- Neoplasia
- Active Hemorrhage
- Eyes, Heart, Viscera

Cochrane Database Syst Rev. 2005, J Rheumatol. 2000 Aug;27(8):1961-9, Pain. 2006 Sep;124(1-2):201-10.

LLLT: Applications

- Muscle Spasm/Trigger points
  - Weekly treatments when secondary to injury
  - Combine with massage and manual therapy
  - Use as maintenance, help treat and prevent precursors to injury, post trial treatment

LLLT: Applications

- Wounds
  - 1-2 times weekly until resolved
- Soft Tissue Injury
  - 4-8 weekly treatments
  - Combined with rest, massage, PROM, home exercises
- Osteoarthritis
  - 1-3x weekly treatments until pain resolved then maintenance

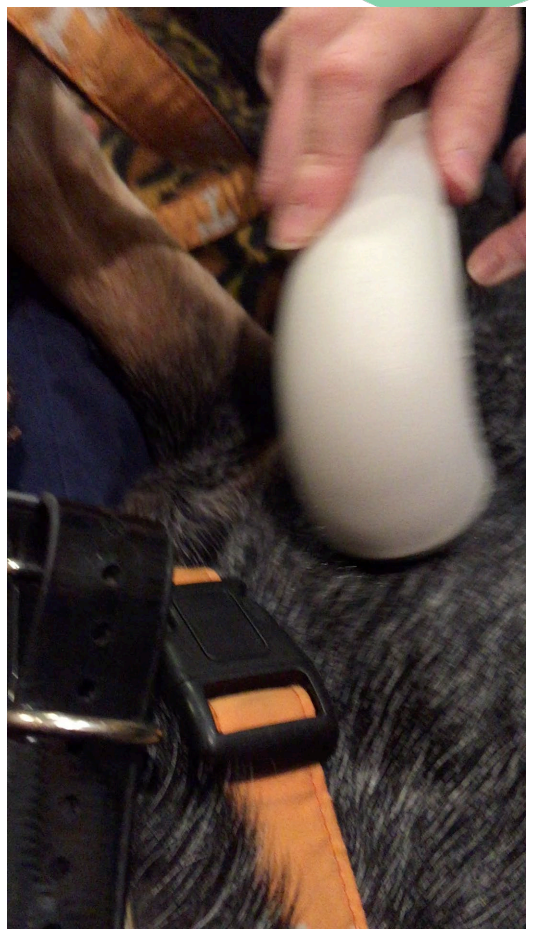
Therapeutic Ultrasound

Therapeutic Ultrasound

- Sound Waves = Pressure Waves

- Reverse Piezoelectric Effect - Contraction or expansion of a crystal in response to voltage across its face
  - Acoustic Streaming
  - Stable and unstable cavitation

- Effects
  - Heating = Thermal
  - Non-Heating = Non Thermal



2003 J Ultrasound Med 22:145-153 • 0278-4297
Steiss, JE, Proceedings of 2nd International Symposium on Rehabilitation and Physical Therapy in Veterinary Medicine, Aug 2002

Properties of Therapeutic Ultrasound

- Acoustic Streaming - Mechanical pressure wave causes movement of fluids along the boundaries of cells
  - Changes ion fluxes and cellular activity
  - Increases cell membrane and vascular wall permeability

- Stable Cavitation – Pulsing of gas bubbles within the sound field without much increase in overall amplitude
  - Results in diffusional changes along the cell membrane, thus altering cell function.

- Unstable Cavitation – Violent collapse of bubbles within the sound field
  - Results in tissue destruction and blood vessel damage

Biological Effects of Non Thermal Therapeutic Ultrasound

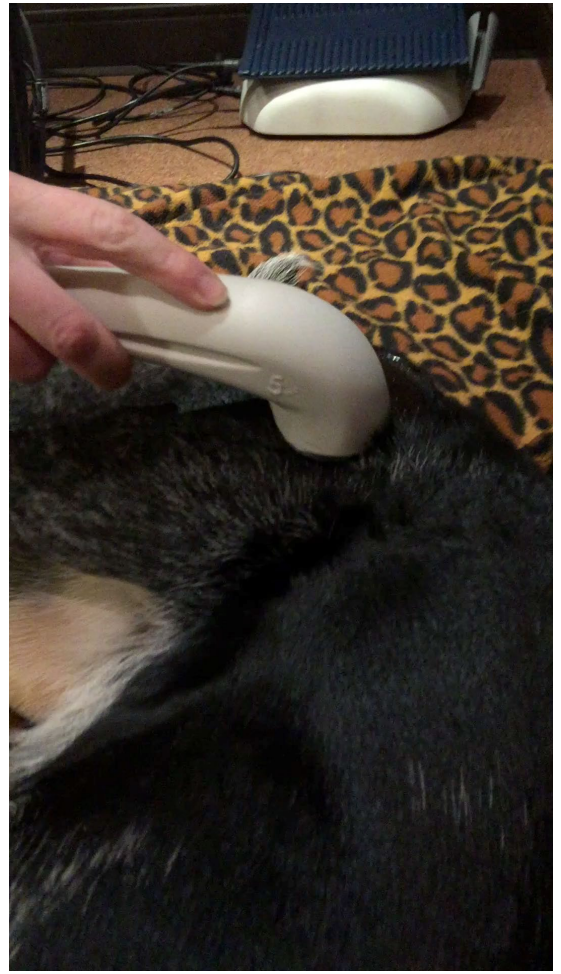
- Accelerate Healing
- Aid in Tissue Regeneration
- Soft Tissue Repair
- Protein Synthesis
- Swelling Reduction
- Bone Repair
- Reduction in Muscle Spasm and Pain

2003 J Ultrasound Med 22:145-153 • 0278-4297

Biological Effects of Thermal Therapeutic Ultrasound

All of Non Thermal Effects Plus……

- Increased Joint Range
- Reduced Joint Adhesions
- Increased Tissue Healing (Chronic)
- Increased Collagen Extensibility
- Decreased Muscle Spasms
- Resolution of Chronic Inflammatory Processes
- Tendon Repair, Reduces Scar Tissue



Indications for TUS

- Muscle spasm
- Trigger points
- Bursitis
- Calcified tendons
- Chronic synovitis
- Joint swelling
- Muscle strains/ligament sprains
- Bursitis/Tendonitis
- Adhesions, contractures, scars
- Facture healing

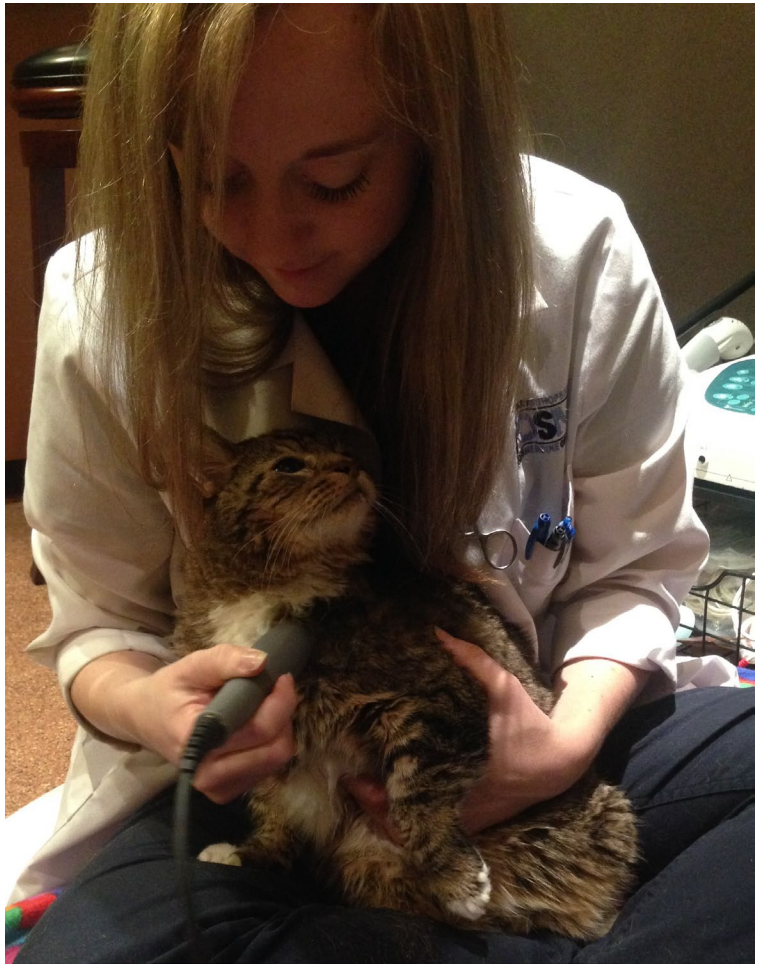
Contraindications for TUS

- Neoplasia
- Infection
- Areas of reduced pain sensation
- Eyes, heart viscera, laminectomy site
- Seizure disorders

Applications of TUS

Tendinopathy

- Acute or chronic tendinopathies
  - Pulsed = acute
  - Continuous = chronic
- 4-8 weekly treatments
- Don’t use with regenerative medicine

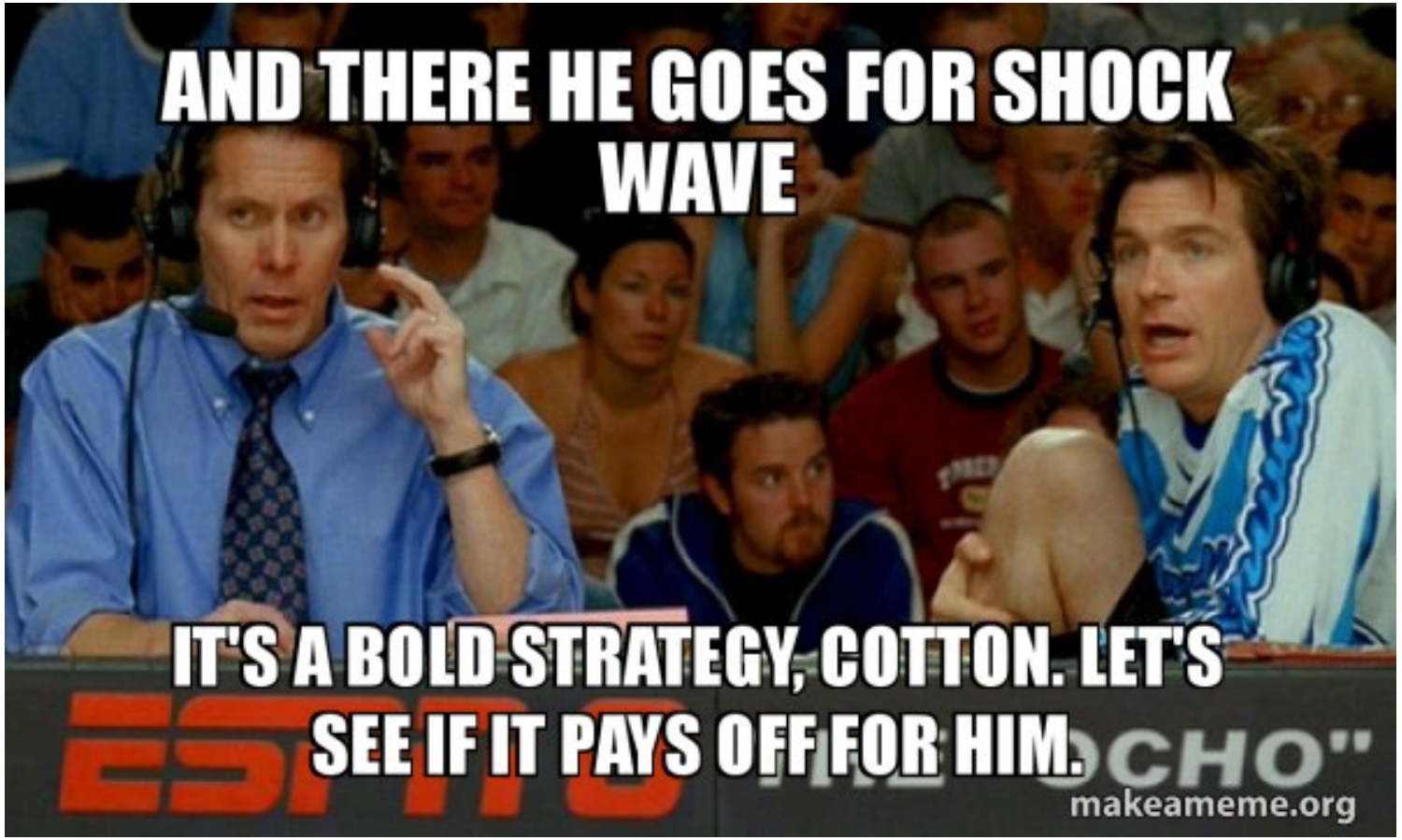


Applications of TUS

Post-operative FHO

- 4-12 weekly treatments
- First 2 weeks = pulsed, then switch to continuous
- Combined with other therapies
  - Goal = improve range of motion
  - Can be used prior to stretching/manual therapy, TherEx, or UWT

Extracorporeal Shockwave Therapy (ESWT)



Extracorporeal Shockwave Therapy (ESWT)

- High Energy Sound Waves
- Pulses
  - Higher energy output
  - Deeper Penetration
  - Stimulate body's healing process similar to other modalities
- May require heavy sedation/anesthesia

ESWT Applications

- Osteoarthritis
- Tendinopathies
- Adhesive Capsulitis of the Shoulder
- Gracilis Contracture
- Stimulate Bone Healing
- Regenerative Medicine
  - Pre-treatment for stem cell therapy

ESWT Canine Research

Extracorporeal Shockwave Therapy for Shoulder Lameness in Dogs

Willem Becker, DVM, DACVS*, Michael P. Kowaleski, DVM, DACVS, Robert J. McCarthy, DVM, DACVS, Cara A. Blake, DVM, DACVS†

The Effect of Shock Wave Therapy on Patellar Ligament Desmitis after Tibial Plateau Leveling Osteotomy

Alissa Gallagher, DVM, Alan R. Cross, DVM, Diplomate ACVS, and Gustavo Sepulveda, DVM, Diplomate ACVR

Georgia Veterinary Specialists, Sandy Springs, GA

Extracorporeal shockwave therapy and therapeutic exercise for supraspinatus and biceps tendinopathies in 29 dogs

J. J. Leeman, K. K. Shaw, M. B. Mison, J. A. Perry, A. Carr, R. Shultz

EFFECT OF EXTRACORPOREAL SHOCK WAVE THERAPY ON ELBOW OSTEOARTHRITIS IN DOGS

DL Millis, DVM, DACVS, CCRP, DACVSMR; M Drum, DVM, PhD, CCRP; D Whitlock, PT, DVM, CCRP
University of Tennessee, College of Veterinary Medicine, Knoxville TN 37918

Review > Vet Clin North Am Small Anim Pract. 2022 Jul;52(4):1033-1042.
doi: 10.1016/j.cvsm.2022.03.007.

Extracorporeal Shockwave Therapy for Musculoskeletal Pathologies

Leilani Alvarez [1]

The evaluation of extracorporeal shockwave therapy in naturally occurring osteoarthritis of the stifle joint in dogs

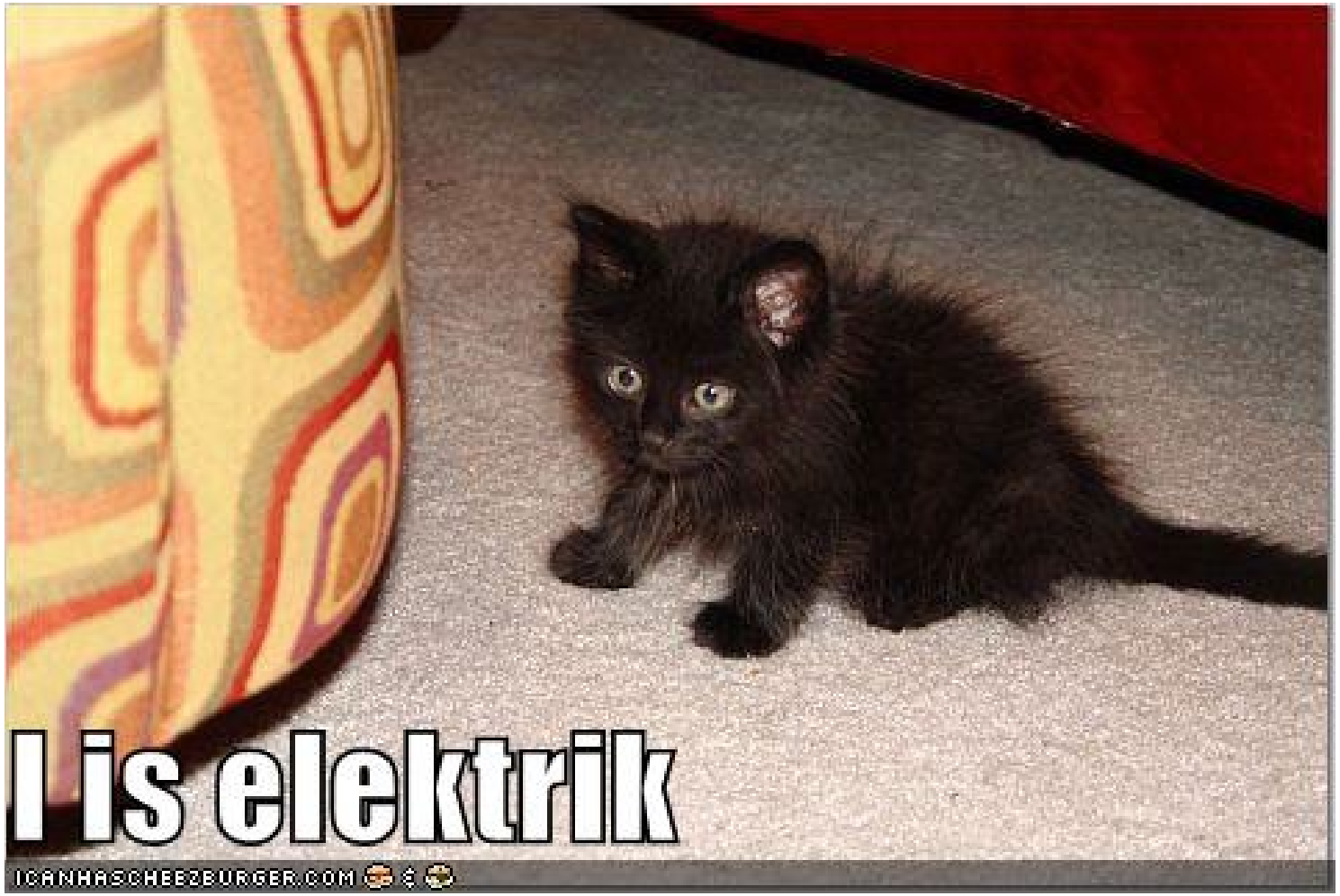
J. Dahlberg[1], G. Fitch[1,*], R. B. Evans[2], S. R. McClure[1], M. Conzemius[1]
[1]Department of Veterinary Clinical Sciences and [2]Veterinary Diagnostic and Production Animal Medicine, College of Veterinary Medicine, Iowa State University, Ames, Iowa, USA

ESWT Protocols (PulseVet)

Condition	# Pulses	Trode	Energy	Sedation	# Treatments	Frequency
Shoulder Tendinopathy (Dog > 20 kg)	1000 (500 cranial/500 lateral)	20mm	E6	Yes	2-3	2 week
Hip OA	1000	X-trode	E5-6	No	1-3	2-3 week
Elbow OA	500-800	X-trode	E3-5	No	1-3	2-3 week
LS Pain (Dog > 20 kg)	1000	X-trode	E6	No	1-3	2-3 week
Acute/subacute myopathy	500 (focused on muscle)	5mm 20mm	E5-6	Yes	2-3	2 week

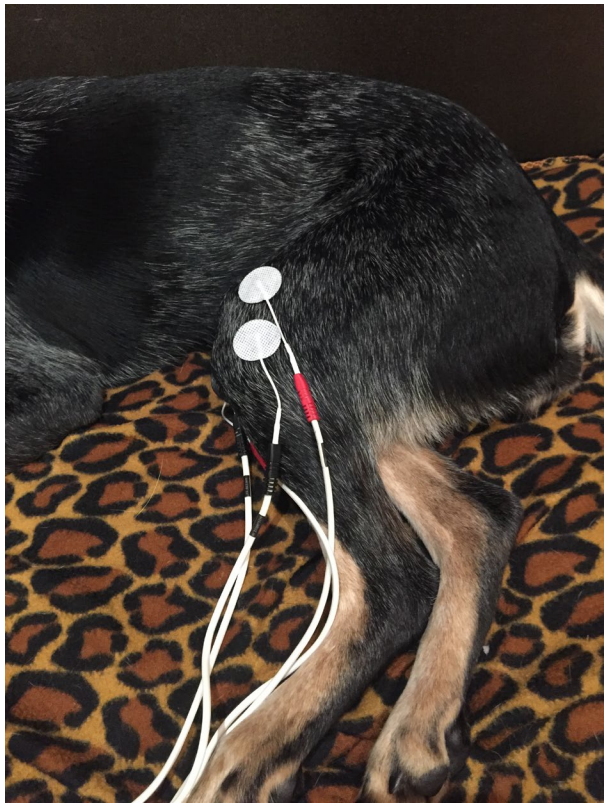
Reference: Alvarez LX. Vet Clin. 2022.

Electrotherapy



Neuromuscular Electrical Stimulation (NMES/E-Stim)

- Use of an electrical current to stimulate muscle tissues located under a stimulation patch
- Electrical current facilitates a muscle contraction of a particular muscle or muscle group



NMES Indications/Contraindications

Indications

- Muscle Disuse Atrophy
- Facilitate Normal Contraction of a Muscle Post Injury or Disease
- Neurological Atrophy

Contraindications

- Skin Infections
- Neoplasia
- Seizure Disorders
- Active Inflammation
- Decreased Pain Sensation

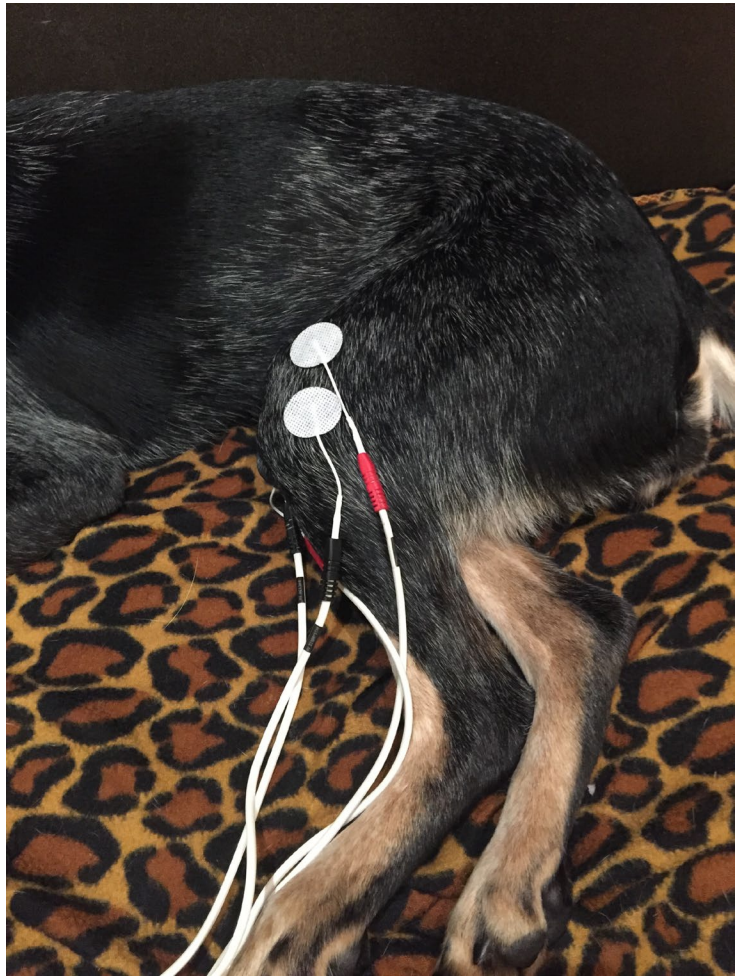
Trans-Cutaneous Electrical Neuromuscular Stimulation (TENS)

- Utilizes different frequencies for pain relief and anti inflammatory effects
- Treat both acute pain and chronic pain
- Stimulate release of endorphins into blood stream and cerebral spinal fluid
- Effects of pain relief short
  - Cumulative effects seen in patients

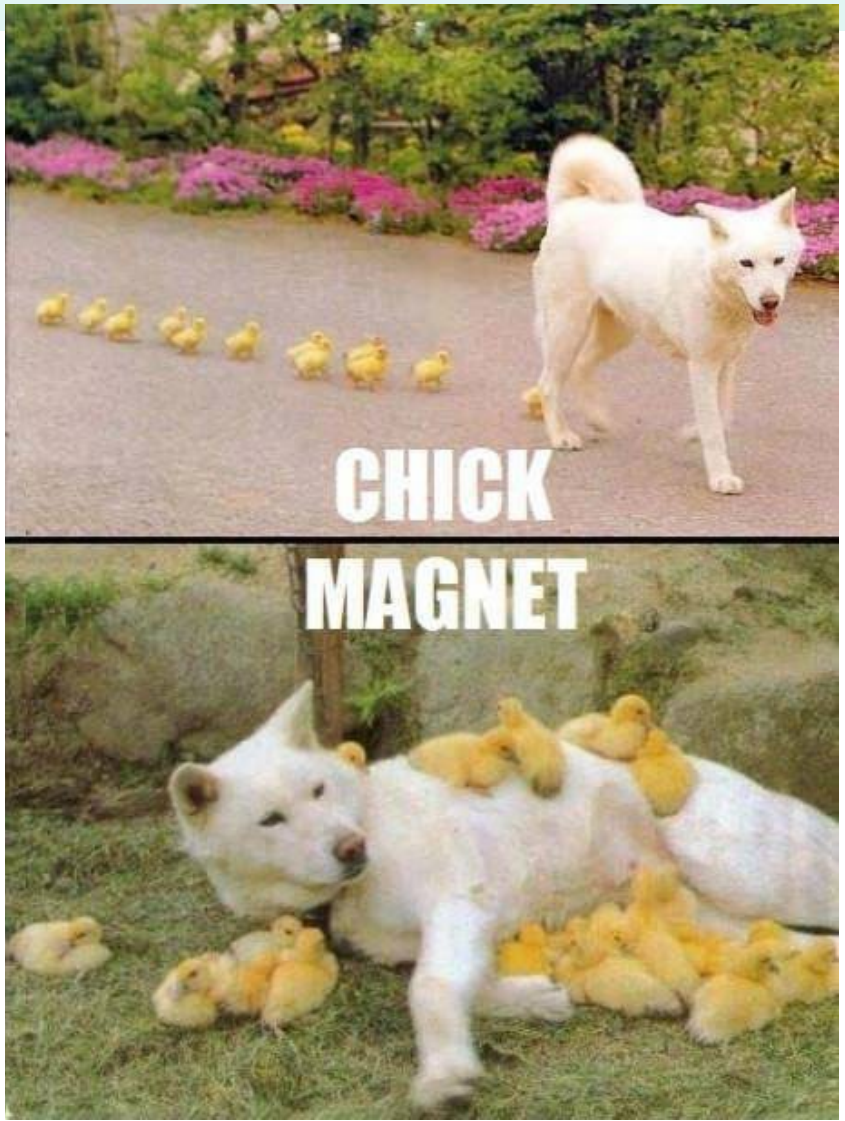
J Altern Complement Med. 2006 Jan-Feb;12(1):39-44

Applications for TENS

- IVDD
- Muscle Spasm
- LS Disease
- Joint effusion/pain

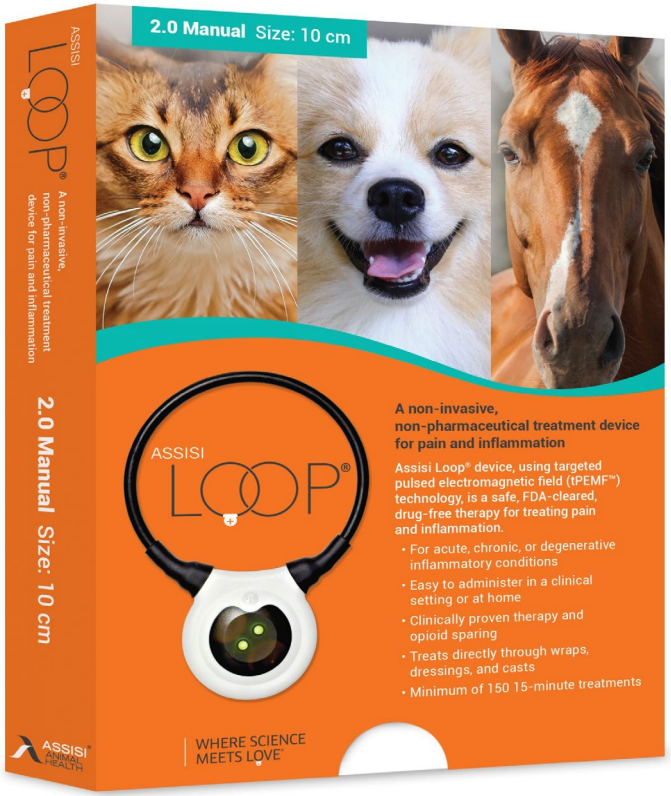


Magnetic Field Therapy



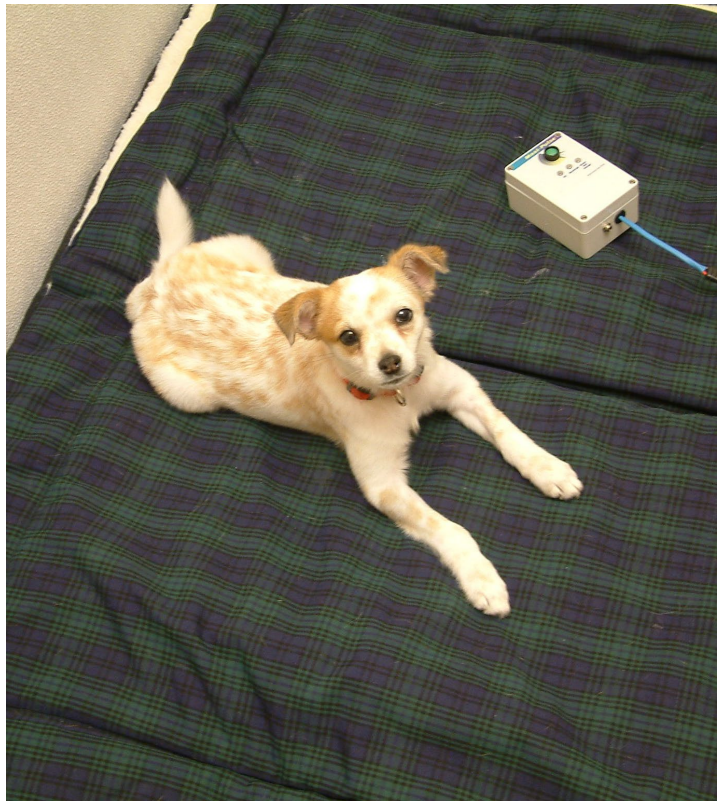
Magnetic Field Therapy

- Damaged cells → Altered Membrane Resting Potential → Ion Exchange → Oxygen Utilization
  - Increase calcium signaling and have anti-inflammatory effects through the generation of nitric oxide



Magnetic Field Therapy Effects

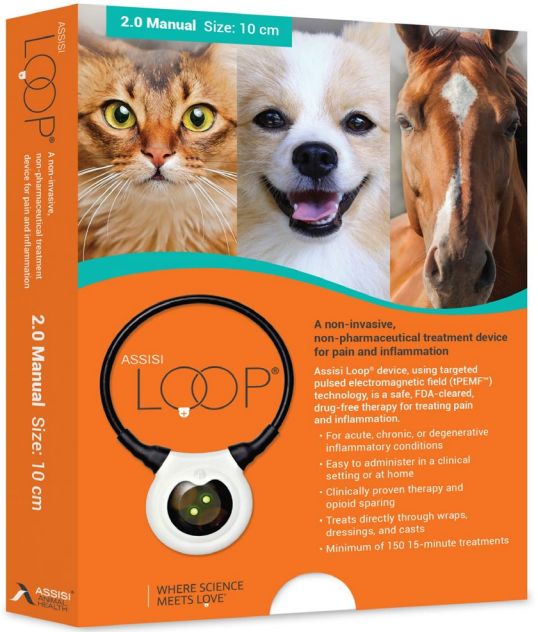
- Stimulates cell proliferation
- Enhanced cartilage repair
- Stimulates tendon fibroblasts
- Increases collagen synthesis
- Modulate neuronal excitability



Curr Med Res Opin. 2001;17(3):190-6, Edge-Hughes, L. Canine Rehabilitation Program Module Two Program Design, April 2005
Steiss, JE, Proceedings of 1st International Symposium on Rehabilitation and Physical Therapy in Veterinary Medicine, Aug 1999

Magnetic Field Therapy Indications

- Bone healing
- Wound healing
- Pain
- Effusion/edema
- Inflammation
- Muscle spasm
- Osteoarthritis
- Neurological disease
- Circulatory disease
- Anxiety



Alvarez L et al, JAAHA, 2019
Zidan N et al, Neurotrauma, 2018
Pankratz K et al, Frontiers, 2021
Kloth et al, Electricity and Magnetism in Biology and Medicine, 1999
Weber et al, Plastic and Reconstructive Surgery, 2004
Strauch et al, J Hand Surg, 2006
Pilla A, Bioelectromagnetic Society Meeting, 2008
Rohde C et al, Plastic and Reconstructive Surgery, 2010
Nelson et al, Rheumatology Int, 2012
Rohan et al, Biological Psychiatry, 2013
Rhode C et al, Plastic and Reconstructive Surgery, 2015

Effect of Targeted Pulsed Electromagnetic Field Therapy on Canine Postoperative Hemilaminectomy: A Double-Blind, Randomized, Placebo-Controlled Clinical Trial

Leilani X. Alvarez, DVM, DACVSMR; John McCue, DVM, DACVIM (Neurology); Nathaniel K. Lam, DVM, DACVS; Gulce Askin, MPH; Philip R. Fox, DVM, MS, DACVIM, DECVIM (Cardiology), DACVECC

J Am Anim Hosp Assoc (2019) 55 (2): 83–91.

https://doi.org/10.5326/JAAHA-MS-6798 **Article history**

- 53 Dogs who underwent hemilaminectomy for IVDD
- Wound healing was significantly improved at 6 wk postoperatively in the treatment compared with the control group
- Pain medications were administered less frequently in dogs receiving PEMF treatment during the 7 day postoperative period compared with the control treatment group with codeine administered 1.8 times more frequently in the control group.
- No untoward effects were recorded in either treatment group.

J Neurotrauma. 2018 Aug 1;35(15):1726-1736. doi: 10.1089/neu.2017.5485. Epub 2018 Apr 2.

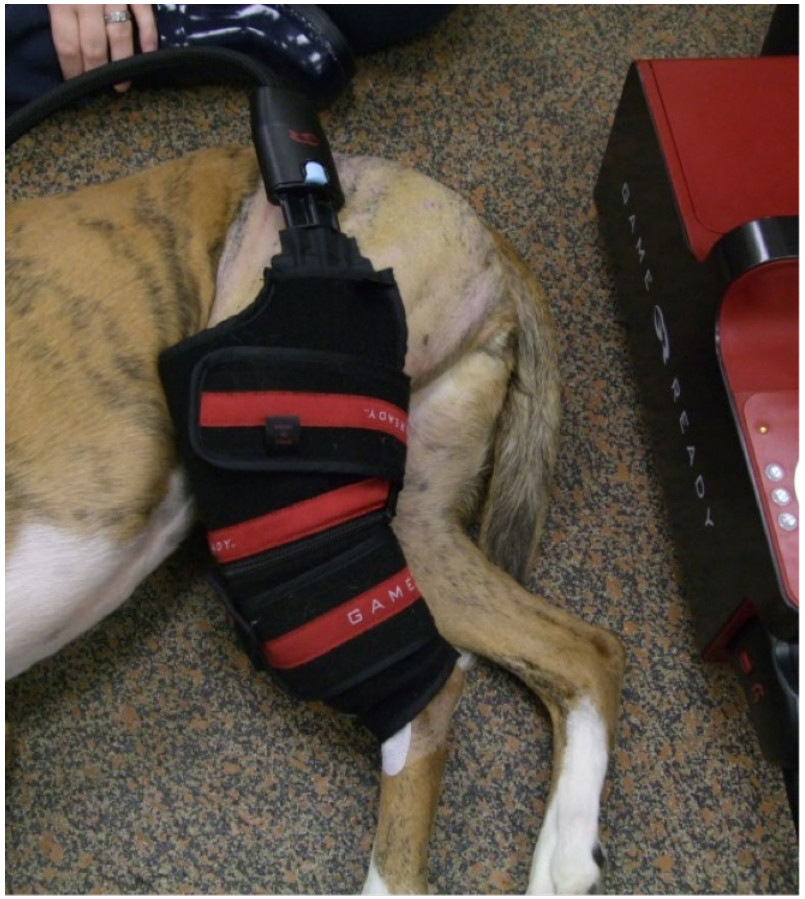
The Effect of Electromagnetic Fields on Post-Operative Pain and Locomotor Recovery in Dogs with Acute, Severe Thoracolumbar Intervertebral Disc Extrusion: A Randomized Placebo-Controlled, Prospective Clinical Trial

Natalia Zidan [1], Joe Fenn [2], Emily Griffith [3], Peter J Early [1], Chris L Mariani [1 4], Karen R Muñana [1 4], Julien Guevar [1], Natasha J Olby [1 4]

- 16 Dogs treated complete thoracolumbar SCI were randomized to receive PEMF (15 min every 2 h for 2 weeks then twice-daily for 4 weeks) or placebo starting immediately after diagnosis.
- Proprioceptive placing was significantly better at 6 weeks and GFAP concentrations were significantly lower at 2 weeks in the PEMF group.
- Mechanical sensory thresholds were significantly higher in the PEMF-treated group.
- Concluded that PEMF reduced incision-associated pain in dogs post-surgery for IVDE and may reduce extent of SCI and enhance proprioceptive placing.

Cryotherapy

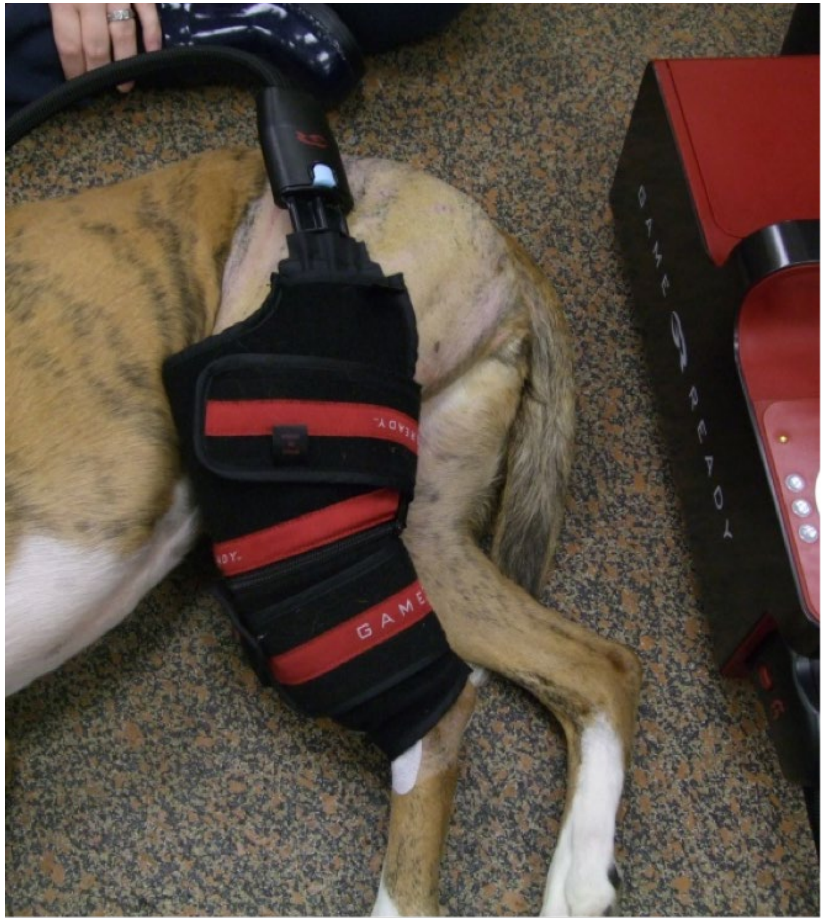
Cryotherapy: Mechanism Of Action/Physiological Effects



- Constriction of Blood Vessels – Decrease local circulation
- Decreased tissue metabolism may inhibit inflammatory mediators
- Reduces nerve conduction – Decrease pain
- Decrease Tissue extensibility

Cold Compression Therapy

- Superior method of reducing edema/inflammation
  - Increases rate and magnitude of tissue cooling compared to traditional cryotherapy
- Cyclic/pumping action mimics muscle contractions
- Aids in moving edema and cellular debris out of treated areas



J Orthop Sports Phys Ther 1998

Cyrotherapy Indications

- <24-48 hours (acute phase inflammation)
- Inflammation
- Pain relief
- Edema/effusion
- Hemorrhage
- Fever

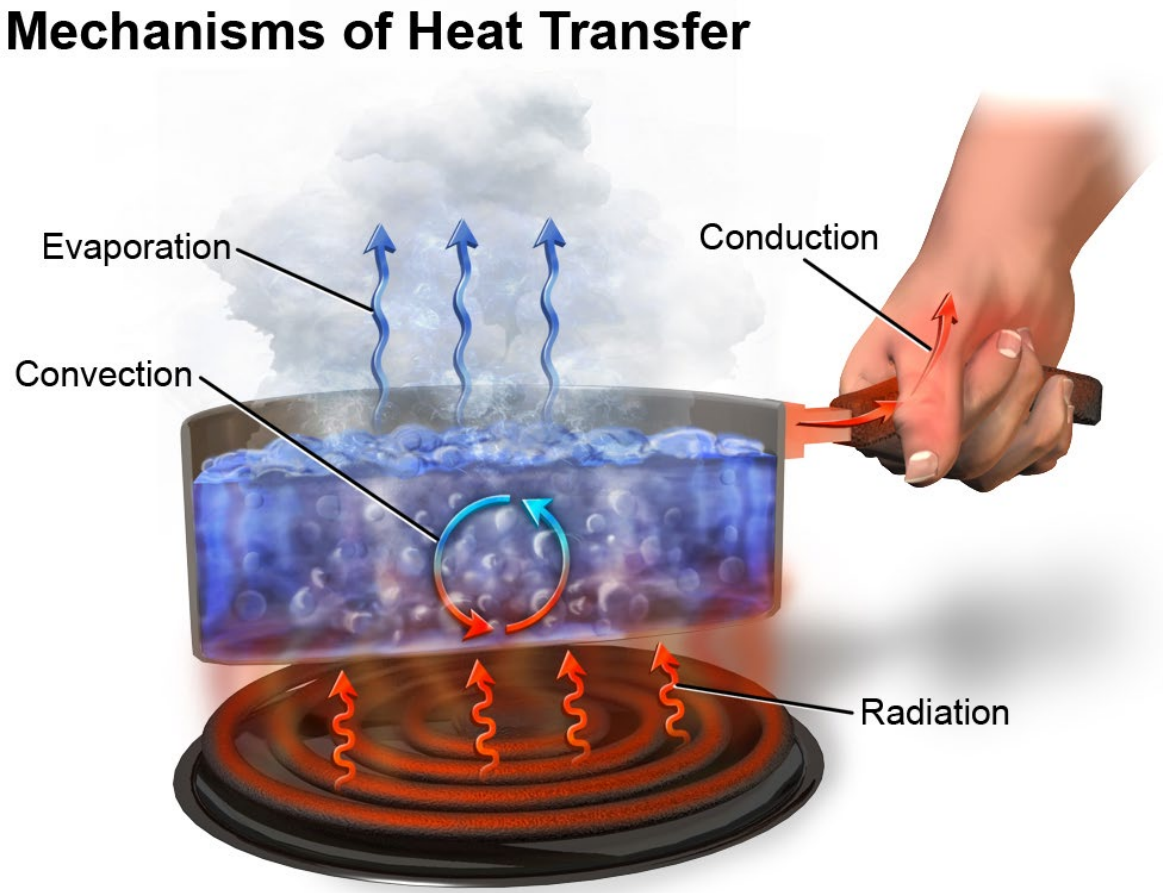
Cryotherapy Precautions

- Impaired Circulation
- Impaired Sensation
- Hypertension
- Directly over acute wounds

Thermal Therapy

Thermal Therapy: Mechanisms of Heat Exchange

- Conduction – Direct Contact – ex: Heating Pad
- Convection – Circulating air or water
- Radiation – Warm to Cool – Infrared Lamp
- Conversion – Energy is Altered – Therapeutic Ultrasound
- Evaporation – Fluid changes to vapor – Perspiration



https://thermtest.com/wp-content/uploads/heat-transfer.png

Thermal Therapy: Physiological Effects

- Increase Local Circulation
- Decrease Pain
- Increase Tissue Extensibility
- Decrease Muscle Spasm
- Muscle Relaxation

Thermal Therapy: Indications

- Pain Relief
- Increase Circulation
- Prepare a stiff joint/muscle for exercise
- Chronic edema
- Muscle spasm
- Facilitate tissue healing
- Tissue Scarring
- >72 hours

Thermal Therapy: Contraindications

- Circulatory impairment
- Areas prone to hemorrhage
- Decreased pain sensation
- Neoplasia

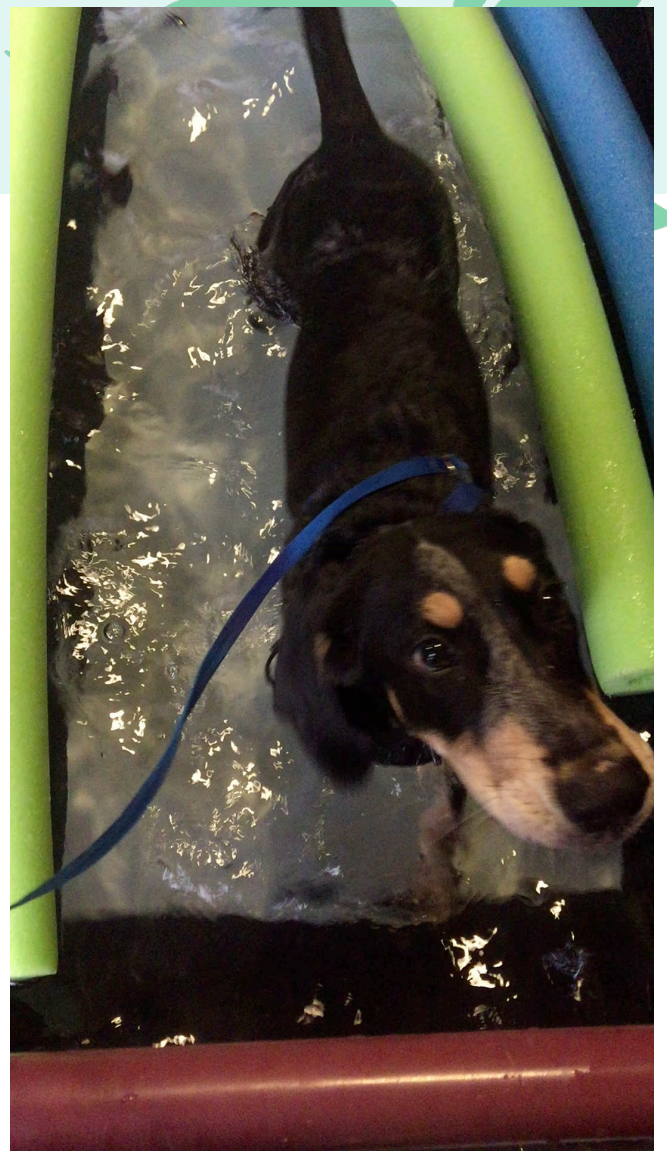
Hydrotherapy

Hydrotherapy: Properties of Water

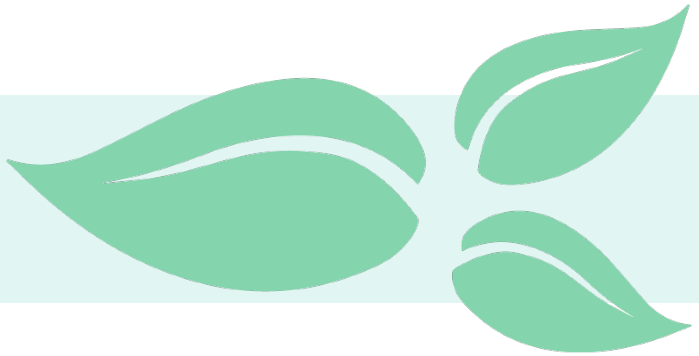
- Buoyancy
  - Decrease joint load
- Resistance/Viscosity
  - Strengthening
  - Cardiovascular
  - Sensory Awareness
- Hydrostatic Pressure
  - Reduce edema
  - Decrease nocioreceptor hypersensitivity (pain)

Hydrotherapy: Benefits

- Increased flexibility/extensibility
- Increased range of motion of joints
- Improved proprioception and balance
- Improve circulation
- Improve discomfort
- Improve mobility and function
- Full Body Workout



Hydrotherapy



Underwater Treadmill

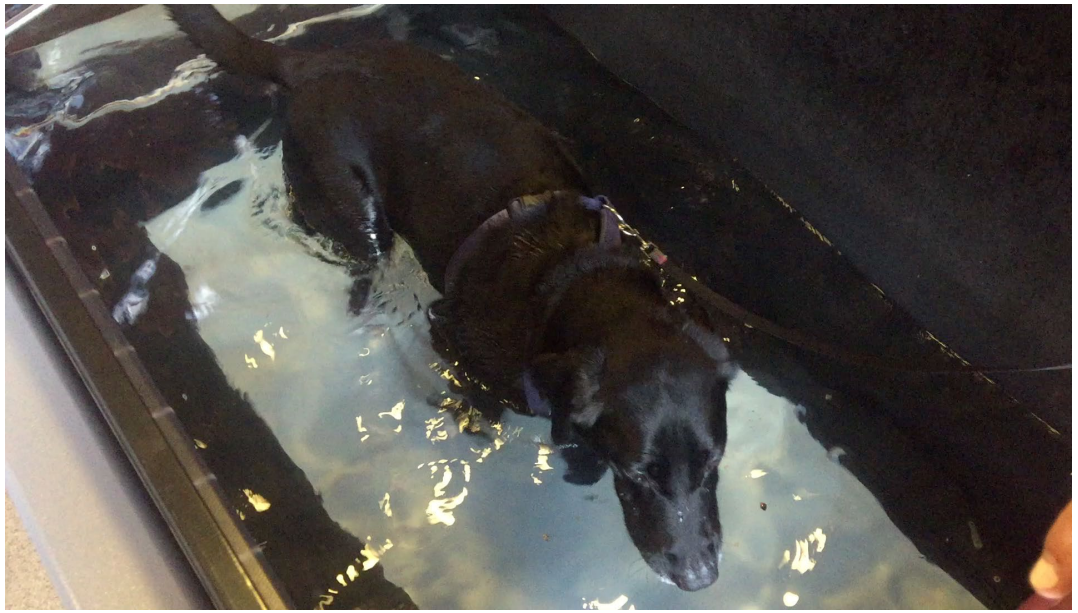
- Controlled Gait
- Closed Chain Exercise
- Strengthens muscles with regulated pressure on joints
- Increase range of motion of joints
- Improves proprioception

Swimming

- Uncontrolled Gait
- Open Chain Exercise
- Limited range of motion of certain joints
- Strengthens muscles with little pressure on joints
- Significant core exercise

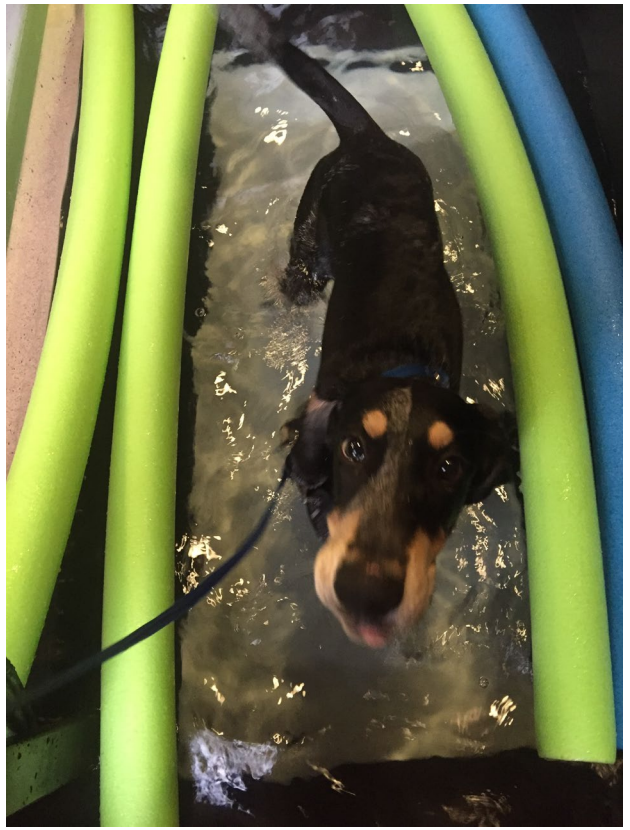
Underwater Treadmill Therapy: Variables

- Water Depth
- Speed
- Turbulence
- Incline
- Temperature
- Assistance Devices



Underwater Treadmill Therapy: Water Depth

- Carpus: 91% weight bearing
  - Increase ROM of carpus and hock
- Elbow: 85% weight bearing
  - Significant Resistance
  - Minimal Buoyancy
- Shoulder: 38% weight bearing
  - Greatest buoyancy
  - Minimal load



A. Tragauer V, Levine D, Millis DL. Percentage of normal weight bearing during partial immersion at various depths in dogs. In *Proceedings of the Second International Symposium on Rehabilitation and Physical Therapy in Veterinary Medicine,* Knoxville, TN, 2002, p 189-191.

Underwater Treadmill Therapy: Speed

- 0.1-0.6 MPH
  - Neurological patients
- 1.0-2.0 MPH
  - Post Surgical
  - Warm up Athletes
- 2.2-5.0 MPH
  - Advanced Patients
  - Conditioning Athletes

Jurek, C., McCauley, L. Hydro-Treadmill Therapy as an Adjuvant to Clinical Practice

Underwater Treadmill Therapy

- 30-34.4 C (86-94 F)
- Jets
  - Resistance
  - Therapeutic
- Assistance Devices
  - Walk a bouts
  - Noodles
  - Floaties
  - Harness or Life Jacket

Dunning D, et al. Effects of water temperature on heart and respiratory rate, rectal temperature and perceived exertional score in dogs exercising in an underwater treadmill. In *Proceedings of the 3rd International Symposium on Rehabilitation and Physical Therapy in Veterinary Medicine*, Research Triangle Park, NC, 2002, p 217.

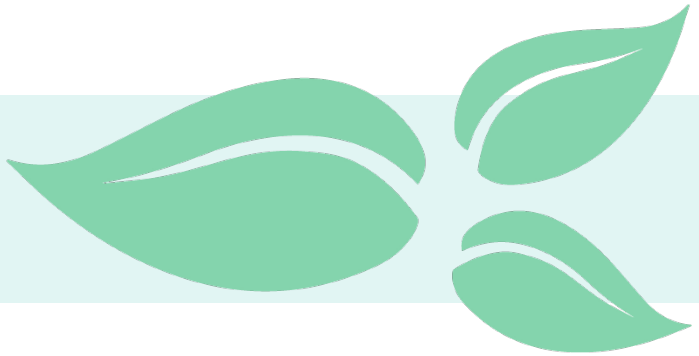
Hydrotherapy: Contraindications

- Unregulated Heart Failure
- Respiratory Dysfunction
- Pyoderma/Dermatitis
- Open wounds
- Incontinence

Home Exercise Plan

- Tailored to each patient and client
- 1-3 sessions/day
- Repetitions/Build Up
- PROM
- Ice/heat
- Stretching
- Strengthening
- Retraining
- Graduating/Return to Function

Integrative Therapies



- Acupuncture/Acupressure (TENS, LLLT)
- Chiropractic/Veterinary Ortho Manipulation (direct)
- Osteopathy/Cranio-Sacral (indirect)
- Reiki (energy)
- Homeopathy
- Herbal medicine
- Aromatherapy
- Medical therapy
- Nutraceuticals

Long Term Plan

- Weekly reassessments
  - Manual
- Formal Rechecks
  - Every 4 weeks
- Re-Training
- Continued Care/Athletes
  - Monthly
  - Trials
  - Maintenance
  - Preseason Assessments

A Quick Word On Cats…

There are MANY Perceived Challenges…

Many of these perceived challenges are

FALSE

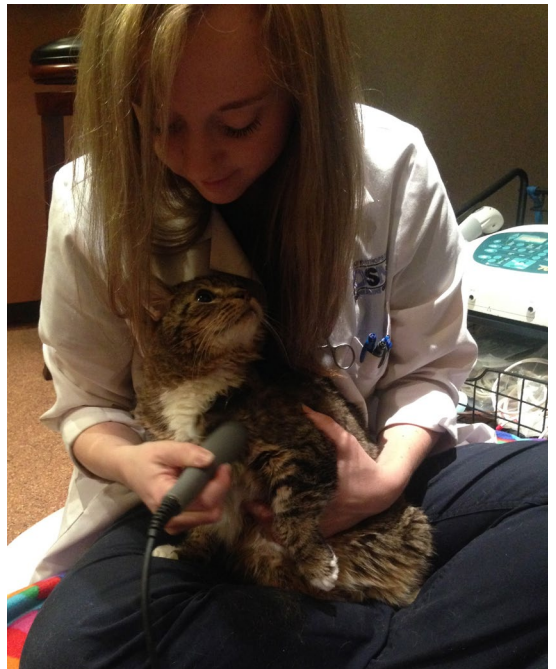
Urban Legend #1:

Cats are not good rehabilitation therapy candidates due to their "independent" behavior and potentially "low tolerance" for handling.

Urban Legend #1:

Cats are not good rehabilitation therapy candidates due to their "independent" behavior and potentially "low tolerance" for handling.

FALSE



Urban Legend #2:

Cats are just small dogs and the same rehabilitation therapy principles and methodologies that work in dogs should work for cats too.

Urban Legend #2:

Cats are just small dogs and the same rehabilitation therapy principles and methodologies that work in dogs should work for cats too.

FALSE

Urban Legend #3:

There is no way to objectively measure outcome of rehabilitation therapy for cats.

Urban Legend #3:

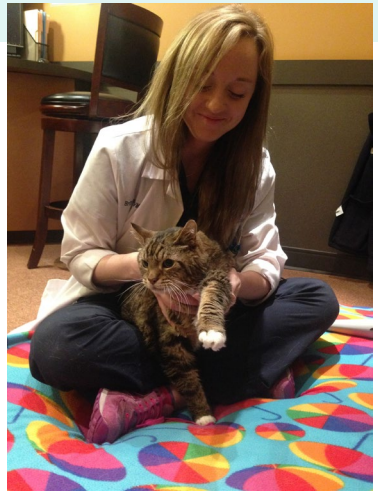
There is no way to objectively measure outcome of rehabilitation therapy for cats.

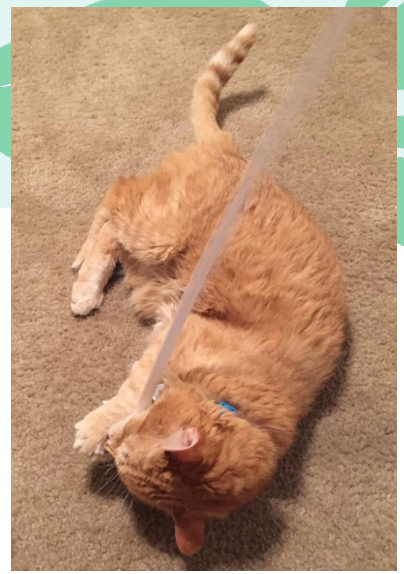
FALSE

Feline Rehabilitation Therapy: Pro Tips

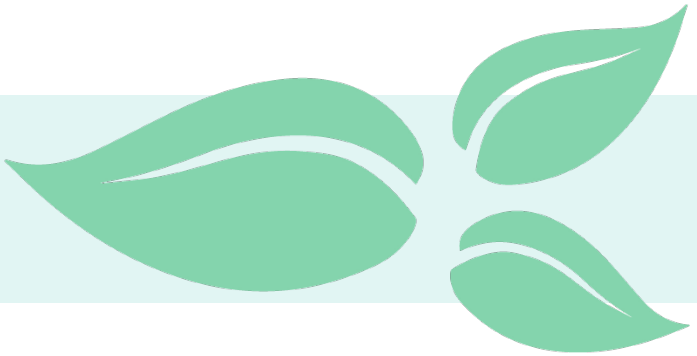
- Establish a diagnosis
- Objective measures
- Keep an open mind
- Creative problem solving is essential
- Lower your modality settings
- Acclimation time
- Quiet setting

Feline Rehabilitation Therapy is like eating dinner at your college cafeteria. The most successful outcomes come only with great creativity and resourcefulness.





Questions??



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