Multimodal approaches to pain management and potential synergies

Neuromodulation and Non-Pharmacological Approaches

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Why Non-pharmacologic?

- Non-pharmaceutical treatments do not share equal status
- Drug side effects, interactions, or comorbid illness limit use for some
- Favorable risk-benefit ratios and evidence supports non-pharmacologic treatment
- Growth in non-pharmacologic treatment options including neuromodulatory devices

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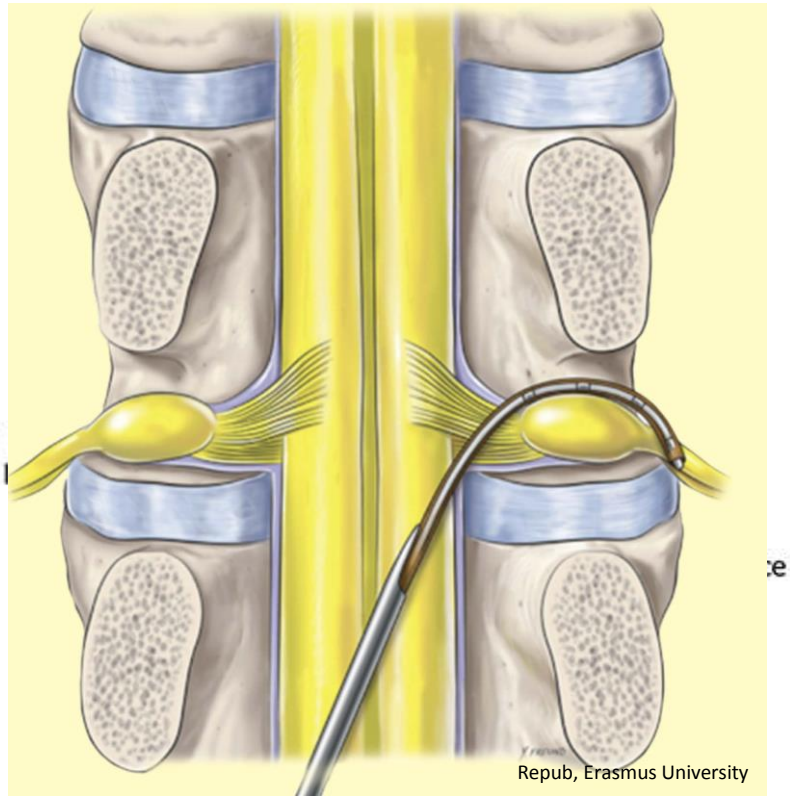
Neuromodulation Devices

- The alteration of nerve activity through targeted delivery of a stimulus to specific neurological sites
- Neural stimulus modulates abnormal neural pathways in CNS or PNS
- Stimulus – electrical current or chemical, non-invasive or invasive
- Goal- therapeutic pain reduction, improve function and QoL

Neuromodulation Options

- Spinal Cord Stimulation
  - Traditional, Burst, High Frequency
  - Dorsal Root Ganglion



Repub, Erasmus University

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Neuromodulation Options

- Spinal Cord Stimulation
  - Traditional, Burst, High Frequency
  - Dorsal Root Ganglion
- Peripheral Nerve Stimulation
  - Sensory
  - Motor

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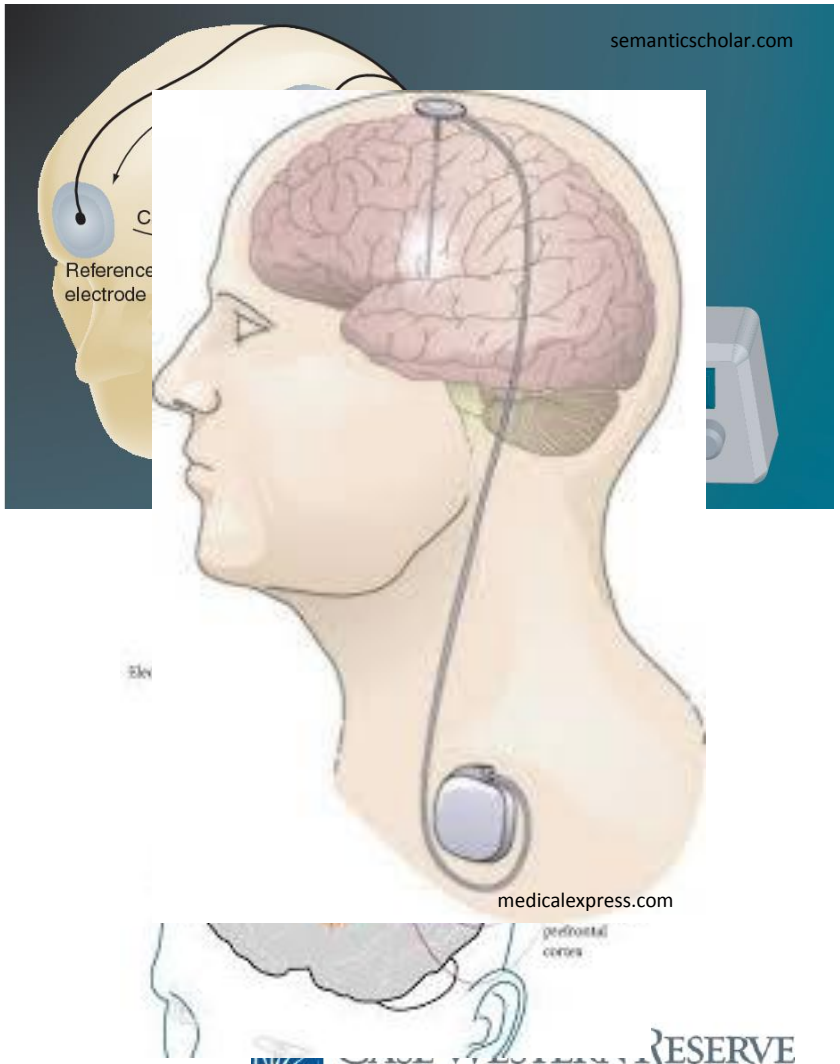
Neuromodulation Options

- Spinal Cord Stimulation
  - Traditional, Burst, High Frequency
  - Dorsal Root Ganglion
- Peripheral Nerve Stimulation
  - Sensory
  - Motor
- Brain Stimulation
  - Transcranial- Direct, Magnetic
  - Deep Brain Stimulation



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Evidence: Pain Relief

		Effect	Evidence	
Migraine:	tDCS vs. Sham	Large	Low	Sharahige, et al 2016.
	Peripheral Nerve Stim vs. Sham	Moderate	Moderate	Chen, et al 2015

Non-pharma or NM Device?

- Based on evidence- which treatment?
- Evidence: no single treatment will suffice
- A better way?

Multimodal Treatment

- Use of separate therapeutic interventions with different mechanisms of action… aimed at different pain mechanisms – adapted IASP Task Force, 2017

- **Hypothesis:** Non-pharmacologic treatments and neuromodulation reduce pain different ways – KneeOA:
  - Exercise: improves biomechanics, alters endogenous pain mechanisms
  - tDCS: improves somatosensory function, encourages neuroplasticity

- Effects may be summative or synergistic

- Little evidence is available to guide multimodal practice

Evidence: Multimodal Therapy

		Effect	Evidence	
CRPS:	SCS + PT vs. PT	SCS + PT > PT, 2yrs	1 RCT	Kemler, et al. 2000; Kemler, et al. 2004

An Example – PNS for HSP

NICHD R01 HD059777

<u>Peripheral Nerve Stimulation</u> – Level 1b Evidence

- Stimulation of **<u>middle and posterior deltoids</u>** through **<u>single</u>** lead
  - 12 Hz, 20 mA, individually tailored pulse width
- 6 hours per day, 3 wks (126h of stimulation)

<u>Physical Therapy</u>

- 8 hrs PT over 4 weeks
  - Proper positioning, handling, slings
  - ROM and strengthening
  - Task-specific therapy to improve ADLs
  - Home exercise program

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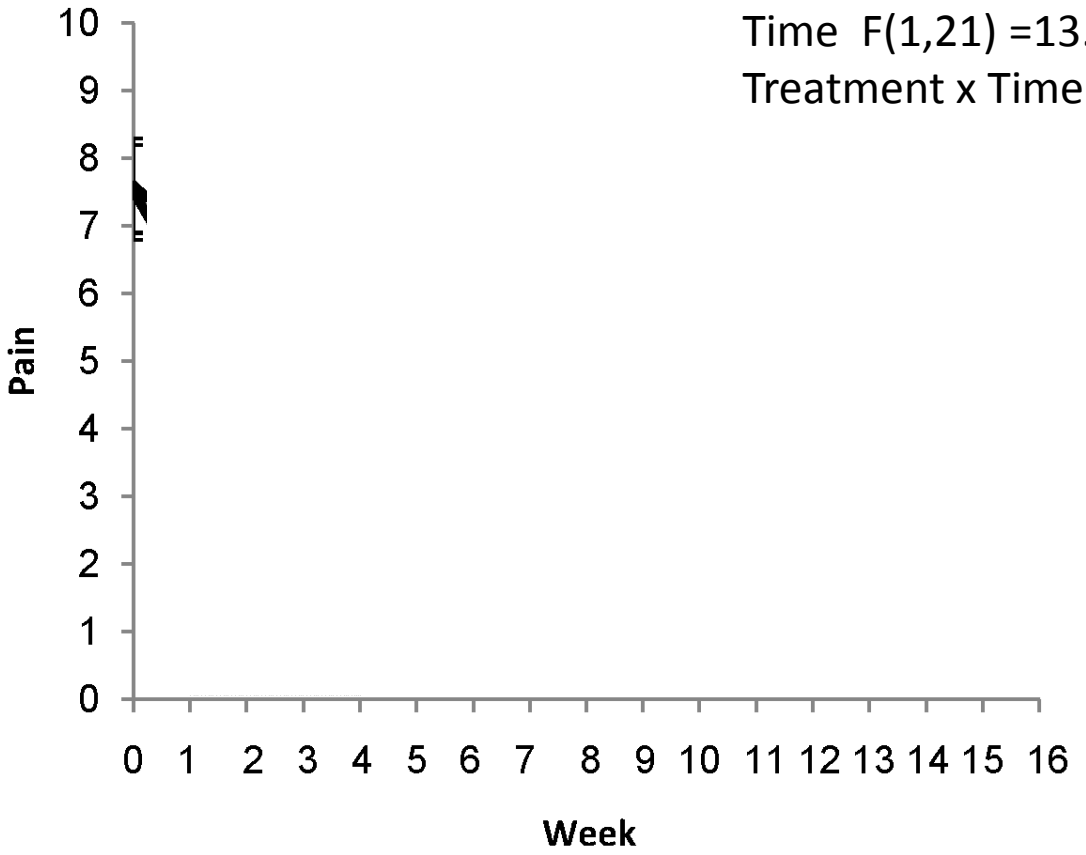
Results- Pain



Time F(1,21) =13.4, P=0.001
Treatment x Time F(1,62) =4.4, P=0.04

PNS (n=13)
PT (n=12)

Wilson, et al. Am J PMR 2014; 93(1):17-28.

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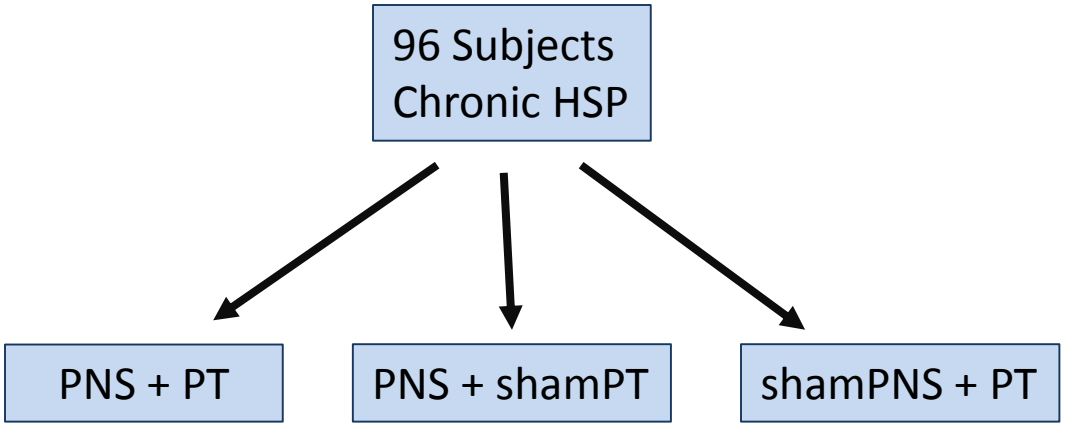
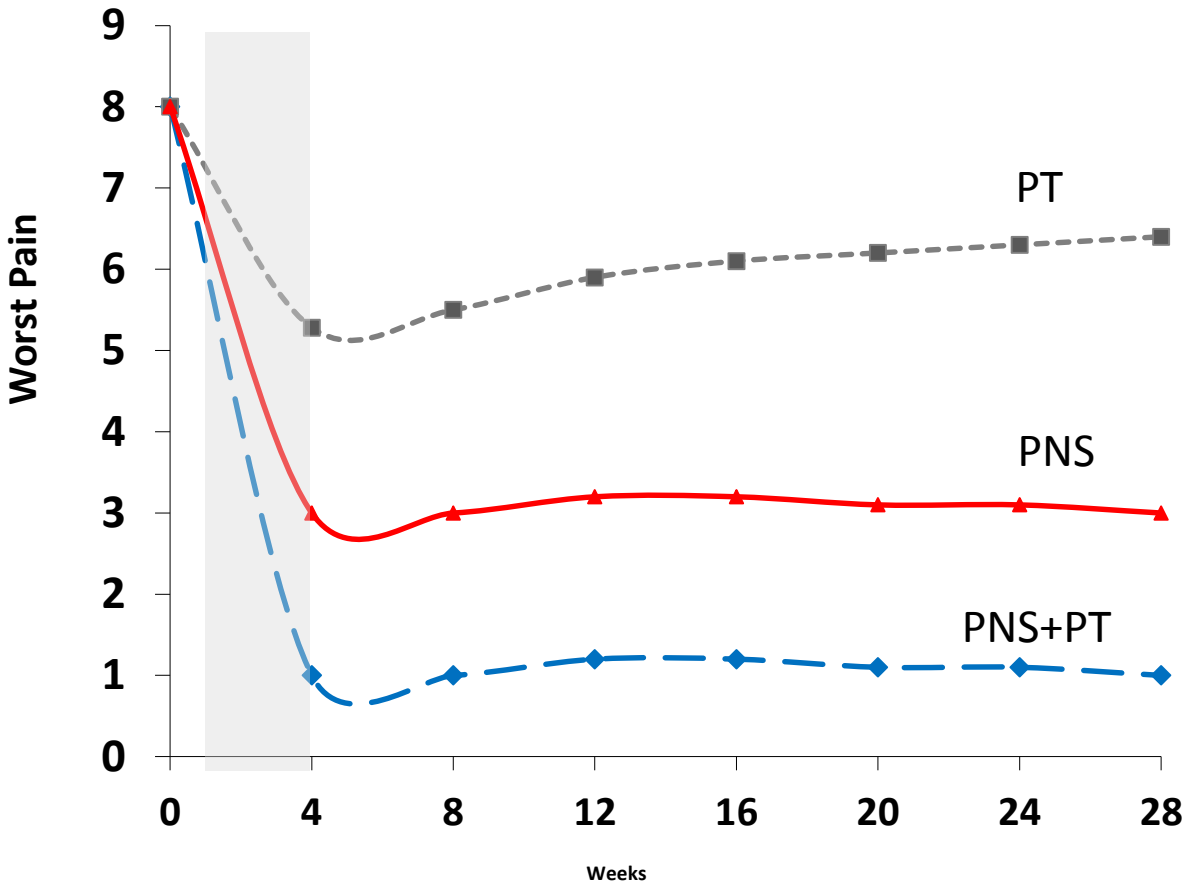
Multimodal Treatment?

- Multisite, RCT – Multimodal Therapy for HSP (NICHD, R01 HD084564)



- Efficacy of multimodal treatment, and incremental differences between treatments
- Additional Outcomes- **Mechanisms**, **Patient Selection**

Expectations



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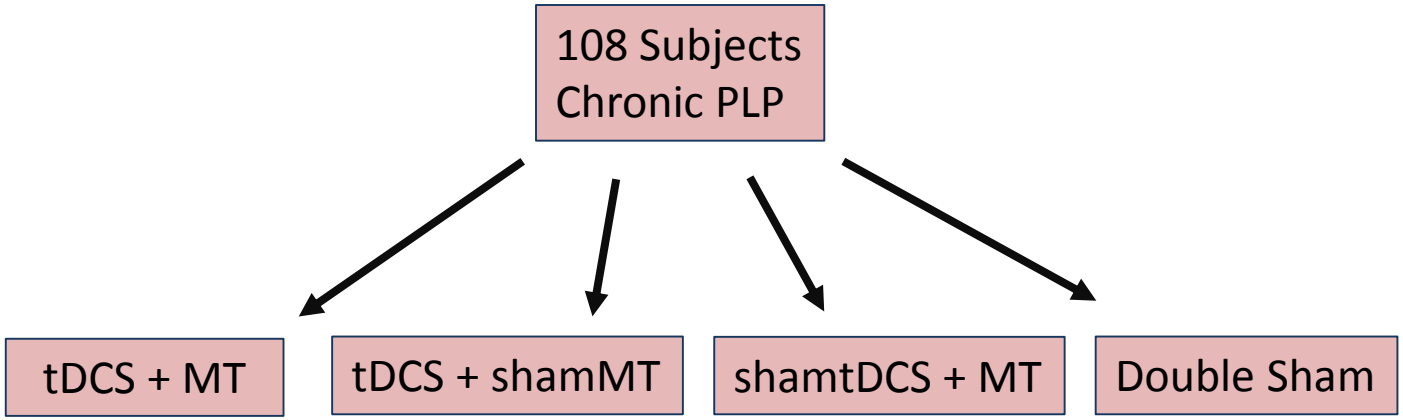
Multimodal Treatment for PLP

- F. Fregni– Optimizing Mirror Therapy + tDCS (NICHD, R01HD082302)



- Efficacy of multimodal treatment compared to sham, and incremental differences between treatments
- Additional Outcomes- **Mechanisms**

Pinto, et al. JMIR Res Protoc. 2016 Jul-Sep; 5(3): e138.

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Ongoing Multimodal Research

- R. Wilson – **Physical Therapy** and **Peripheral Nerve Stimulation** for Subacromial Impingement Syndrome – MetroHealth Rehabilitation Institute, Cleveland, Ohio (R01 HD093661)

- A. Oulette – **tDCS** and **Sensorimotor Retraining** for CLBP – Western Sydney University, New South Wales, Australia

- W. Chang- **tDCS** and **Exercise** for Knee OA - Western Sydney University, New South Wales, Australia

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Thank you

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