
# Simplifying CRPS: CRPS Treatment Update

*Chairperson:*

Eduard Vaynberg, MD

Director of Pain Management

Department of Anesthesiology

Boston Medical Center

**Tuesday, March 26th, 2024**

**12:50-1:30pm**


# Holistic Approach to CRPS Treatment

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# Disclosures

- I have nothing to disclose.

# Complex Regional Pain Syndrome (CRPS)

- CRPS is a disease of many different mechanisms usually presenting at different times in the course
- A patient may fully meet diagnostic criteria one day and not the next, which does not indicate a cure
- Patients may improve and relapse
- Symptoms can spread

- Tracking severity of CRPS symptoms (i.e., beyond pain intensity) is important for monitoring treatment-related changes in clinical care

Harden et al. Pain Medicine, 23(S1), 2022, S1–S53
Goebel et al. PAIN 162 (2021) 2346–2348

# Complex Regional Pain Syndrome (CRPS)

## DIAGNOSTIC CRITERIA/REVISED BUDAPEST CRITERIA

| | SYMPTOMS (≥3) | SIGNS (≥2) |
|---|---|---|
| **SENSORY** | Hyperalgesia +/or allodynia | Hyperalgesia +/or allodynia |
| **VASOMOTOR** | Temperature asymmetry +/or<br>Skin color changes +/or<br>Skin color asymmetry | Temperature asymmetry +/or<br>Skin color changes +/or<br>Skin color asymmetry |
| **SUDOMOTOR/ EDEMA** | Edema +/or<br>Sweating changes +/or sweating asymmetry | Edema +/or<br>Sweating changes +/or sweating asymmetry |
| **MOTOR/TROPHIC** | Decreased ROM +/or<br>Motor dysfunction (weakness, tremor, dystonia) +/or<br>Trophic changes (hair, nails, skin) | Decreased ROM +/or<br>Motor dysfunction (weakness, tremor, dystonia) +/or<br>Trophic changes (hair, nails, skin) |

Harden et al. Pain Medicine, 23(S1), 2022, S1–S53

# Complex Regional Pain Syndrome (CRPS)

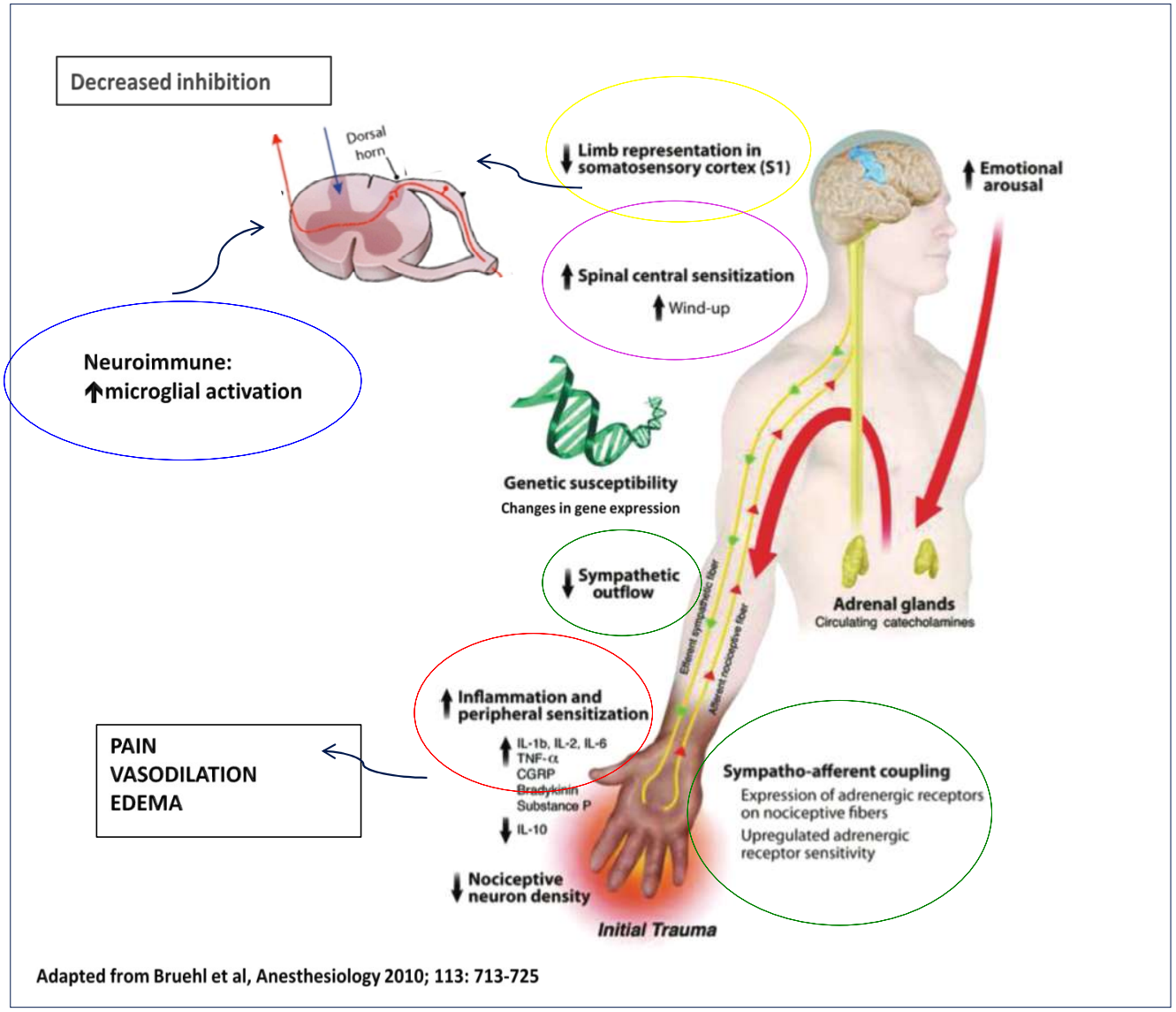
## DIAGNOSTIC CRITERIA/REVISED BUDAPEST CRITERIA

- Continuing pain, which is disproportionate to any inciting event
- There is no other diagnosis that better explains the signs and symptoms

Harden et al. Pain Medicine, 23(S1), 2022, S1–S53

# CRPS Subtypes

| SUBTYPE | | |
|---|---|---|
| **CRPS Type I** | No nerve lesion can be identified | CRPS-Type I vs. Type II distinction may neither be clinically significant nor affect the specific therapeutic treatment. |
| **CRPS Type II** | Associated with a nerve lesion | |
| **CRPS NOS** | IASP CRPS criteria not fulfilled but has some but not all features of CRPS required for formal diagnosis, and no other diagnosis better explains the clinical features. | |
| **CRPS** with Remission of Some Features | Previously documented as having fully met CRPS criteria but currently has CRPS features insufficient to meet the diagnostic criteria. | |



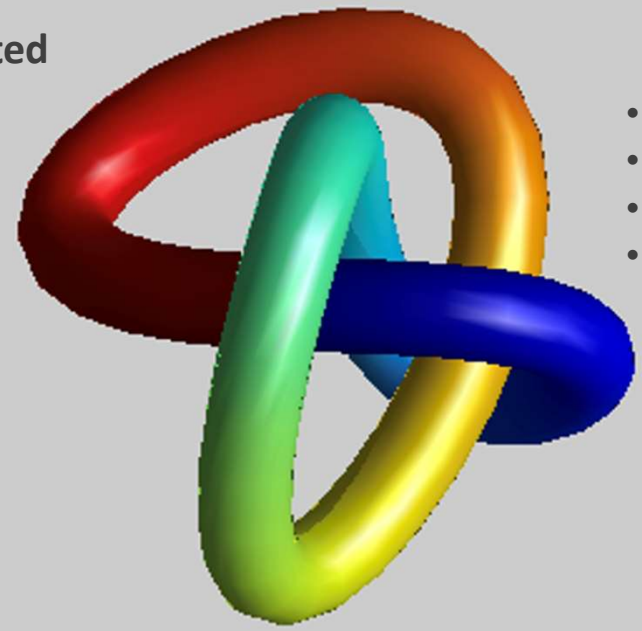

Adapted from Bruehl et al, Anesthesiology 2010; 113: 713-725

A DISEASE OF MANY DIFFERENT MECHANISMS

# Holistic Approach to Treatment

Integrated

Comprehensive



- Physical Medicine
- Pharmacotherapy
- Procedural
- Mind/Body

**Caring for the entire person including the physical and psychological**

# Physical and Occupational Medicine

- Interdisciplinary Management
- Mirror Therapy
- Functional Restoration Program
- Physical Therapy
- Occupational Therapy
- Vocational Rehabilitation
- Recreational Therapy

# Pharmacotherapy

- Membrane stabilizers
- Antidepressants
- Calcitonin
- Bisphosphonates
- NMDA receptor antagonists
- Anti-Hypertensives & a-Adrenergic Antagonists
- Baclofen
- Low Dose Naltrexone
- Corticosteroids
- NSAIDS
- Topical ointment
- Opioids

# Procedural

- Spinal Cord Stimulation
- Dorsal Root Ganglia Stimulation
- Peripheral Nerve Stimulation
- Scrambler Therapy
- Acupuncture
- Targeted Injections
- Sympathetic Blocks

# Mind/Body

- Pain Neuroscience Education
- Pain Psychology
- Mindfulness
- Support Groups
- Yoga
- Reiki
- Tai Chi
- Qi Gong
- Acupuncture
- Exercise

*"Perhaps few persons […] can realize the influence of which long-continued and unendurable pain can have upon both body and mind".*

-Silas Weir Mitchell "Nerve Injuries" 1864

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# **Graded Motor Imagery (Mirror Therapy)** for Chronic Regional Pain Syndrome

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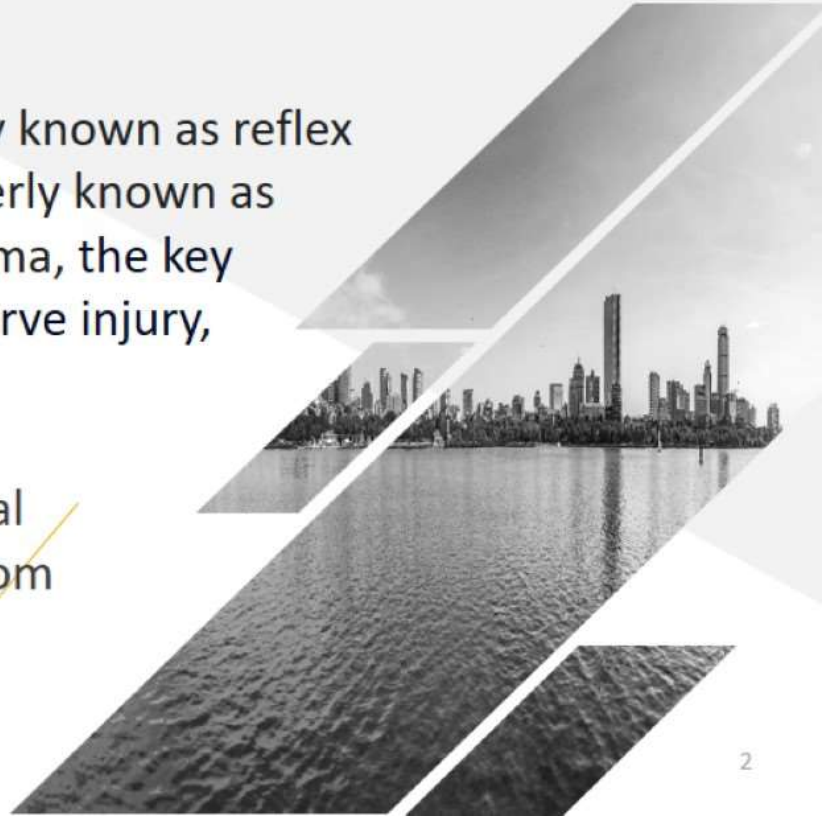
New England Baptist Hospital

# Chronic Regional Pain Syndrome

## THERE ARE TWO TYPES: TYPE 1 & TYPE 2

The syndrome was divided into CRPS type 1, formerly known as reflex sympathetic dystrophy (RSD), and CRPS type 2, formerly known as causalgia. While both types occur typically after trauma, the key distinguishing feature is the presence of a definite nerve injury, which is absent in type 1, but present in type 2.

90% of those diagnosed with CRPS are Type 1. Cortical abnormalities are similar to those observed in Phantom Pain, Parkinson's and Stroke.



# Chronic Regional Pain Syndrome

## CRPS IS A DISEASE OF THE CENTRAL NERVOUS SYSTEM (Janig, Baron, Rommel et al.)

### Peripheral abnormalities include:

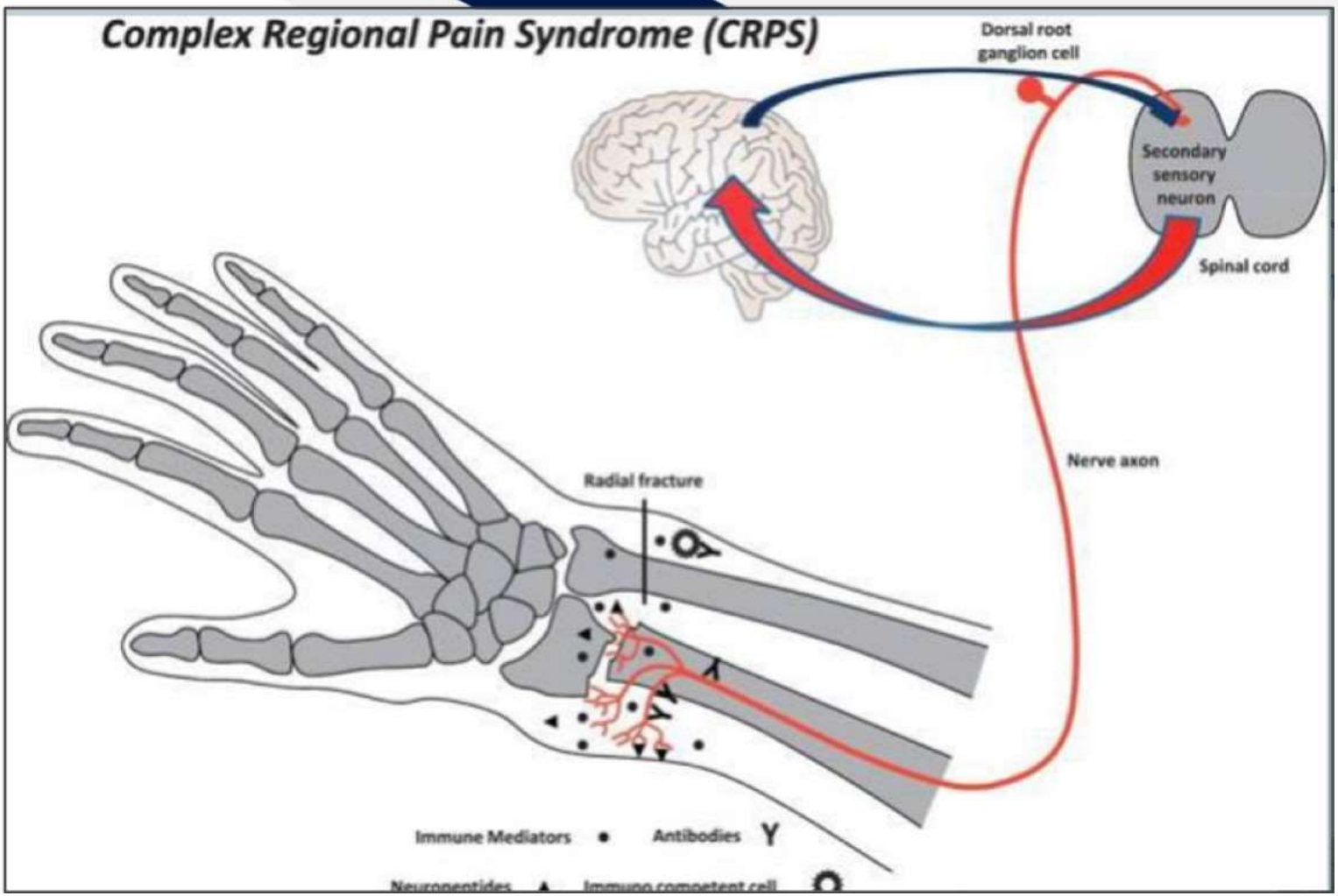
1. Increased spontaneous pain with elevated sympathetic activity
3. Enhanced neurogenic inflammatory response
4. Reduced sympathetic vasoconstriction so important for controlling muscle blood flow
5. Reduction of proprioceptive reflexes essential for motor coordination of the body and rapid feedback for limb functioning
6. Skin hypoxia – low levels of oxygen causing bluish skin – a hallmark of CRPS

### Central abnormalities include:

1. Disruption of sensory cortical processing particularly in pre-motor cortices
2. Disinhibition of the motor cortex associated with pain and phantom pain
3. Disrupted body schema – largely a perceptual disturbance in Complex CRPS

These abnormalities are also common with amputees with phantom limb pain, and stroke patients.

Farousanfar 2002; Baron 2002; Weber 2001; Koban 2003; Jacobsen 2002; Rommel 1993; Schweakreis 2003; Schwoebel 2001


Complex Regional Pain Syndrome (CRPS)
Dorsal root ganglion cell
Secondary sensory neuron
Spinal cord
Nerve axon
Radial fracture
Immune Mediators
Antibodies
Neuropeptides
Immuno competent cell

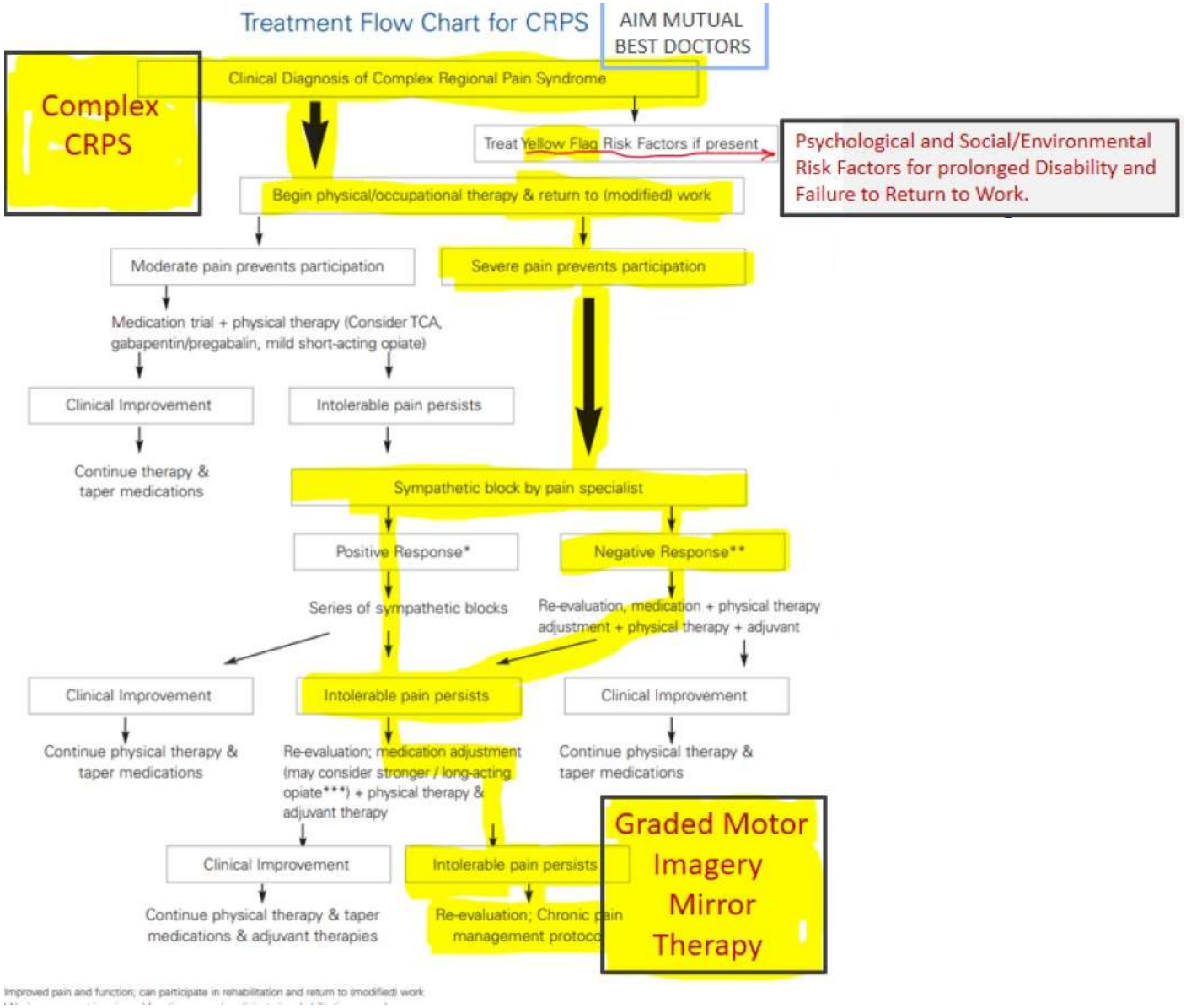
# CRPS: Strategies and Treatment Approaches

## LEFT RIGHT DISCRIMINATION TRAINING <> GRADED MOTOR IMAGERY

Graded Motor Imagery (Mirror Therapy) is "brain-training" used to treat complex pain and movement problems. It aims to activate cortical networks and has been successful for acute-CRPS1, phantom pain, and stroke rehabilitation.

Mirror therapy involves placing the affected limb inside a mirror-box such that visual feedback of the affected limb is replaced with that of the unaffected limb.

Mirror therapy is thought to reconcile motor output and sensory feedback loops and activate premotor cortices which have intimate connections with visual processing areas. Evidence based studies show mirror therapy is effective.


Treatment Flow Chart for CRPS
AIM MUTUAL BEST DOCTORS
Complex CRPS
Clinical Diagnosis of Complex Regional Pain Syndrome
Treat Yellow Flag Risk Factors if present
Psychological and Social/Environmental Risk Factors for prolonged Disability and Failure to Return to Work.
Begin physical/occupational therapy & return to (modified) work
Moderate pain prevents participation
Severe pain prevents participation
Medication trial + physical therapy (Consider TCA, gabapentin/pregabalin, mild short-acting opiate)
Clinical Improvement
Intolerable pain persists
Continue therapy & taper medications
Sympathetic block by pain specialist
Positive Response*
Negative Response**
Series of sympathetic blocks
Re-evaluation, medication + physical therapy adjustment + physical therapy + adjuvant
Clinical Improvement
Intolerable pain persists
Clinical Improvement
Continue physical therapy & taper medications
Re-evaluation; medication adjustment (may consider stronger / long-acting opiate***) + physical therapy & adjuvant therapy
Continue physical therapy & taper medications
Clinical Improvement
Intolerable pain persists
Graded Motor Imagery Mirror Therapy
Continue physical therapy & taper medications & adjuvant therapies
Re-evaluation; Chronic pain management protoco
Improved pain and function; can participate in rehabilitation and return to (modified) work

2024
Work Related Injuries Workshop

# CRPS: Strategies and Treatment Approaches

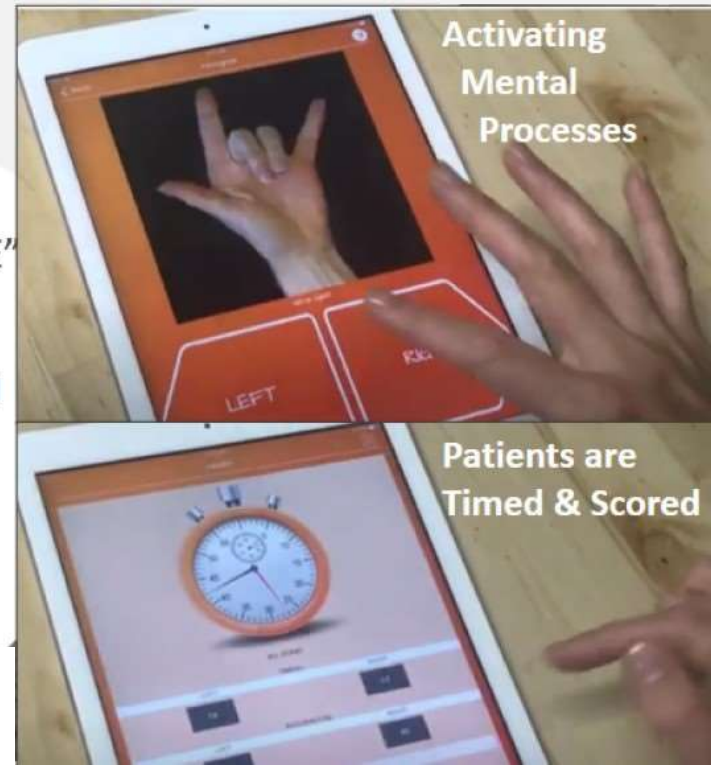
## L/R DISCRIMINATION TRAINING <> Implicit Training

When treating intolerable pain of CRPS with Mirror Therapy – if pain increases - reduce the intensity of movement in the motor imagery treatment by doing one or more of the following: (*3 Stages*)

1. Left Right Discrimination Training using an App such as "RECOGNISE"

L/R involves **implicit** motor imagery tasks which require patients to make judgments on visual stimuli that automatically (and implicitly) activate mental processes stimulating the affected limb. The App records the number of correct judgments and the time elapsed for each successive session showing their progress.

Over time the patient gains skills in L/R discrimination which eventually prepares brain pathways for Mirror Therapy itself.



# CRPS: Strategies and Treatment Approaches

L/R DISCRIMINATION TRAINING <> Observational > Implicit > Explicit

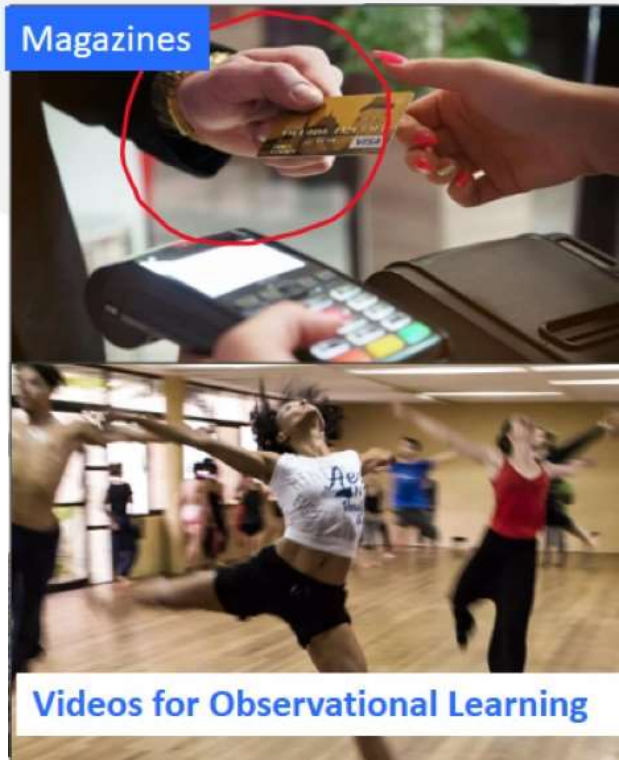
If pain increases with the RECOGNISE APP – again, reduce the intensity of the program by doing the following:

## 2. Left Right Discrimination Training using Magazines and Videos

Have the patient get some magazines and circle all the left extremities in one magazine, and all the right extremities in another magazine. This is a less intense implicit operation. If this increases pain, then....

Suggest the patient watch YouTube videos which uses 'observational' tracking of left/right motion which can play a similar role in learning.

This should also be reinforced using internal VISUALIZATION.



# CRPS: Strategies and Treatment Approaches

## L/R DISCRIMINATION TRAINING PREPARING FOR **MIRROR THERAPY**

3. Once the patient has prepared with **implicit training** – using observing learning viewing normal limb movement via YouTube Videos; Left/Right Discrimination Training circling the respective limbs in magazines; Advancing to the L/R RECOGNISE App; Reinforcing with Internal Visualization

Then hopefully the brain has been prepared for a more successful "explicit" **Mirror Therapy experience.**





# CRPS: Strategies and Treatment Approaches

## GRADED MOTOR IMAGERY [MIRROR THERAPY] FOR PHANTOM LIMB PAIN

**This is case of "Crush Injury" of left hand with history of CRPS followed by a Below Elbow Amputation & Prosthetic with Motorized Hand**

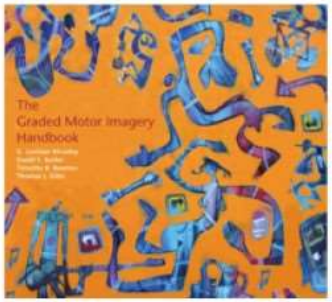
Stage 3. Successful Mirror Therapy for Amputee with Phantom Limb Pain

- Watching basketball and tennis while at rest (observational)
- Circling left and right hands respectively in Magazines (implicit)
- Using the RECOGNISE App (implicit – actively judging)

- Formal graded motor imagery treatment (Mirror Therapy)
- Eliminated Phantom Limb Pain with five treatments & daily homework

# Chronic Regional Pain Syndrome

## GRADED MOTOR IMAGERY THERAPY

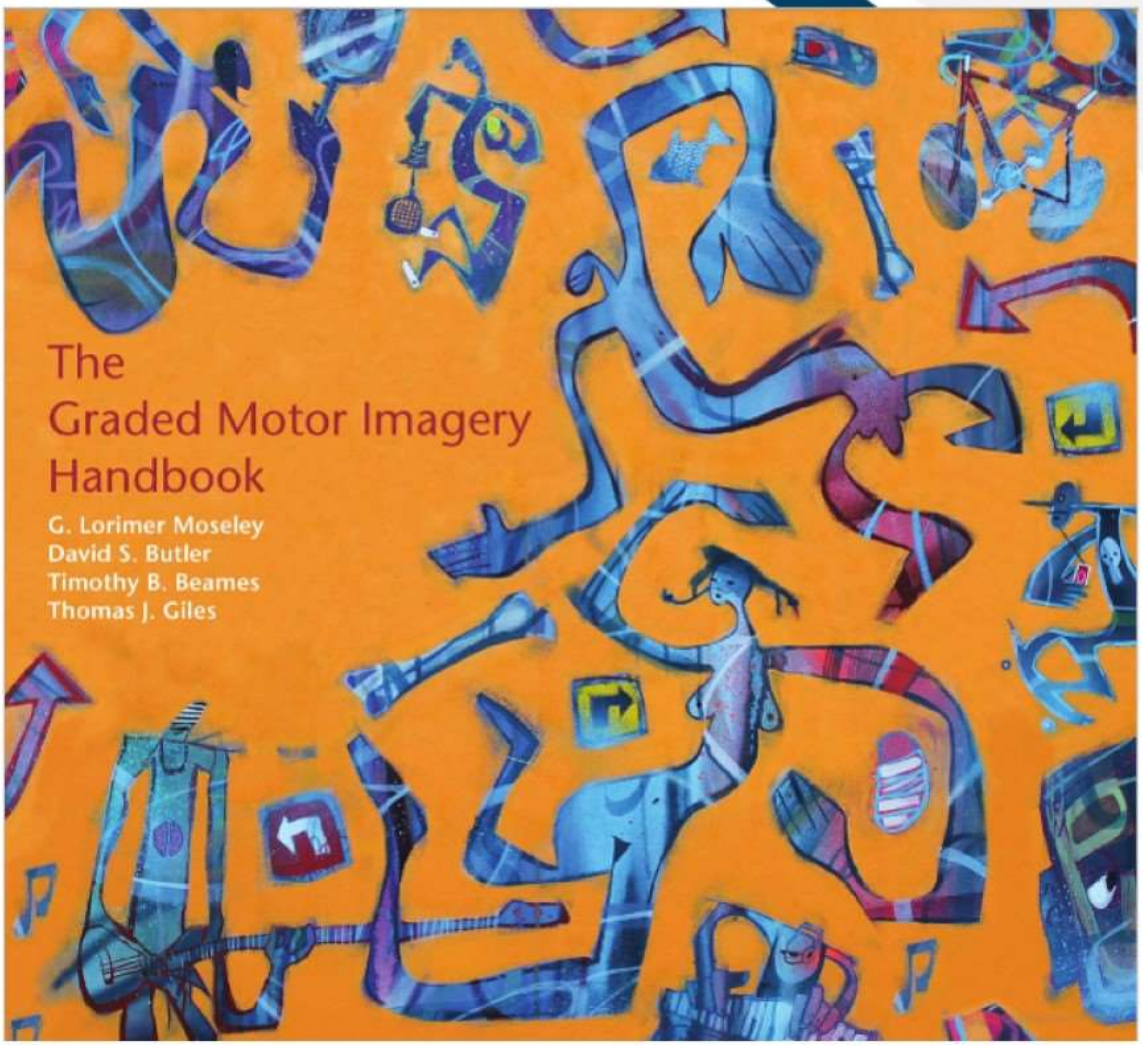



https://www.noigroup.com/graded-motor-imagery/

The effects of graded motor imagery and its components on chronic pain: a systematic review and meta-analysisKJ Bowering, NE O'Connell, A Tabor, MJ Catley... - The journal of Pain, 2013 – Elsevier

[BOOK] The graded motor imagery handbook GL Moseley, DS Butler, TB Beames, TJ Giles - 2012 - books.google.comGraded Motor Imagery (GMI) is now a part of that revolution, not only as a series of novel ... Graded Motor Imagery is a complex series of treatments including graded left/right judgement

Update on the effects of graded motor imagery and mirror therapy on complex regional pain syndrome type 1: A systematic reviewG Méndez-Rebolledo, V Gatica-Rojas... - Journal of back and ..., 2017 - content.iospress.comGraded motor imagery (GMI) and mirror therapy (MT) is thought to improve pain in patients with complex regional pain syndrome (CRPS) types 1 and 2.


The
Graded Motor Imagery
Handbook
G. Lorimer Moseley
David S. Butler
Timothy B. Beames
Thomas J. Giles


# **Case** Discussion

Eduard Vaynberg, MD

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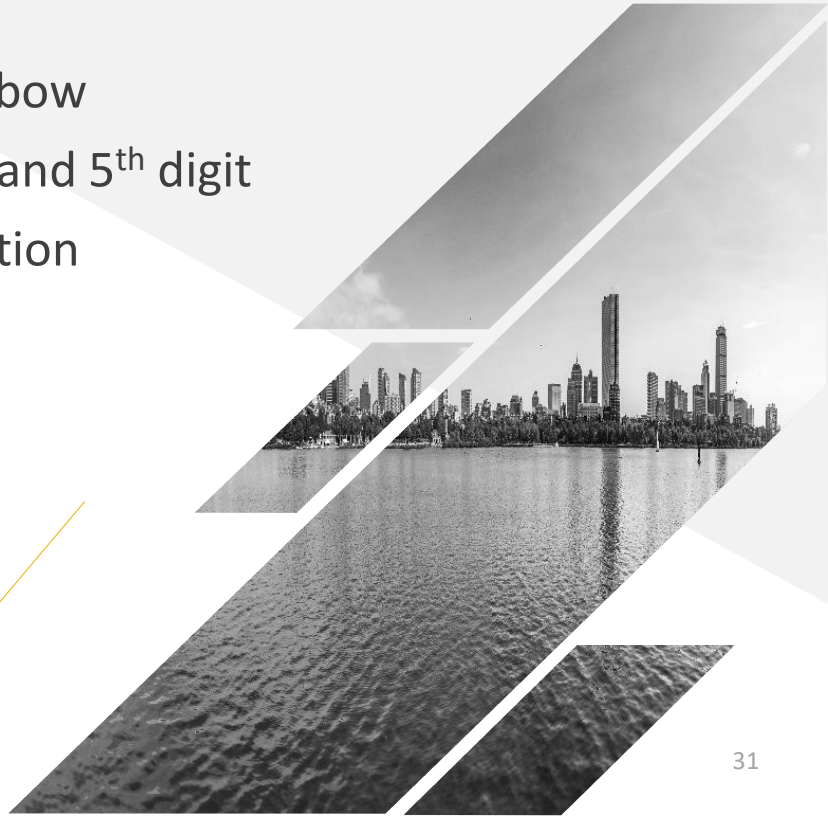
Disclosure: Member of Medtronic Speaker Bureau

# Disclosure

- Medtronic Speaker Bureau

# Clinical Scenario

- 42 year-old male machinist with crush injury to right elbow
- Severe pain in the right elbow shooting to the right 4th and 5th digit
- Ulnar nerve transposition surgery complicated by infection
- Persistent severe pain three month after surgery



# Clinical Scenario

- Referred to pain clinic
- Severe light touch intolerance over right hand
- Color changes
- Temperature changes
- Started two weeks after surgery

# Clinical Scenario

- Treated with Gabapentin titrated up to 600 mg three times per day with modest relief
- Two stellate ganglion blocks with short term relief
- Declined spinal cord stimulation
- Further options?


# Thank you