

SOMATOSENSORY REHABILITATION FOR ALLODYNIA IN CRPS OF THE UPPER LIMB

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INTRODUCTION

- Somatosensory rehabilitation (SSR) is a standardized method of evaluation and treatment of somatosensory and/or neuropathic conditions, including allodynia.¹
- Allodynia is a common feature of complex regional pain syndrome (CRPS), and is often a barrier to participation in classic rehabilitation programs, and is associated with poor prognosis.^{2,3}
- This retrospective cohort study examined the effectiveness of SSR for reducing allodynia in persons with CRPS of one upper limb.

Key principles of SSR

- Precise evaluation to define allodynic territory using 15g monofilament and Rainbow Pain Scale (See Figs. 1&2)
- Anatomical hypothesis of cutaneous nerve branch(es) implicated (see Fig. 1)
- STOP sensitization by temporarily **NOT TOUCHING** painful area (minimize evoked pain)
- Comfortable stimulation of a related cutaneous branch – **'distant vibrotactile counterstimulation'** (DVCS)

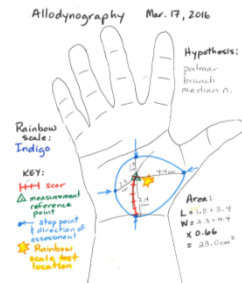
PURPOSE

Our primary research question is: **How effective is somatosensory rehabilitation for allodynia in persons with CRPS of one upper limb?**

METHODS

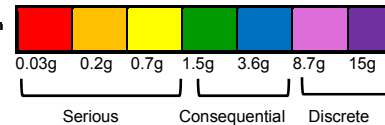
- Independent chart review of all client records (May 2004-August 2015) in the Somatosensory Rehabilitation Centre of the Human Body (Fribourg, Switzerland)
- 48 cases met the Budapest criteria for CRPS of one upper limb.
- Outcomes measures: *Questionnaire Douleur St. Antoine (QDSA)* [French McGill Pain Questionnaire]; total area of allodynia as recorded by mapping the area of skin where a 15g monofilament was perceived as painful (Fig. 1), and the Rainbow Pain Scale (allodynia severity: minimum pressure eliciting pain within the allodynic territory) (Fig. 2).⁴

Figure 1. Sample allodynia map



- Hypothesis designates the cutaneous nerve branch related to the mapped territory
- Arrows indicate the direction of testing, while dot indicates where the subject indicated 'STOP'
- Green triangle indicates invariant measurement reference point
- Star indicates the point where the rainbow pain scale was tested
- Rainbow pain scale indicates the severity of allodynia

Figure 2. Rainbow Pain Scale. The colours represent the severity of allodynia as represented by the smallest amount of pressure which elicits a painful response.



RESULTS

For demographics and clinical features, see Table 1.

- Intention to treat – included all records with baseline and follow-up of any duration; some cases had multiple nerve lesions therefore n varies across analyses
- Baseline QDSA ($x=51.4$, $SD=17.4$) vs. final QDSA ($x=20.4$, $SD=20.0$)
- Paired sample t-test comparing tQDSA at baseline and final evaluations
- $t(57)=13.6$, $p < 0.001$.
- Effect size Cohen's $d = 1.64$ (accounting for inherent correlation of paired samples).
- 58% of cohort completed treatment, 13.2% dropped out, 12% ceasing treatment for other work/health/life issues.
- Final tQDSA scores for those completing a full course of treatment were lower than for full cohort ($x=12.3$, $SD 10.2$, range 0-41).

Table 1. Demographic and clinical features

Demographics & clinical features	Mean	SD	Range	Demographics & clinical features	Frequency	Percentage
Age (in years)	45.4	13.4	18-74	Gender	Females=34 Males=14	70.4% 29.6%
Duration of NeP (in months)	31.2	57.5	1-335	Rainbow pain scale	Violet=12 Indigo=9 Blue=12 Green=7 Yellow=10 Orange=1 Red=8	20.3% 15.3% 20.3% 11.9% 17.0% 1.7% 13.6%
Baseline tQDSA (in points)	48.1	17.7	5-99	Nerve lesion region (n=88)*	Hand=62 Arm=21 Thoracic=5	70.5% 23.9% 5.7%
Final tQDSA score (in points)	20.1	20.0	0-75			
Area of allodynia (in cm ²)	65.7	78.6	2.6 – 320.8			
Duration of DVCS (in days)	81.0	76.4	5 - 381			

DISCUSSION

- Mechanism-specific rehabilitation interventions for CRPS are needed to address burden of pain.⁵⁻⁷
- SSR is a method of assessment and treatment specifically intended to address the somatosensory aspects of neuropathic pain, including allodynia often observed in CRPS.¹
- Effectiveness of SSR mirrors results in other pain syndromes with features of central sensitization (such as phantom limb pain) when peripheral pain generators are addressed.⁸⁻¹⁰
- SSR represents a distinct departure from traditional 'desensitization' interventions which flood the area of altered sensation with intense somatosensory stimuli, with the intent of producing somatosensory accommodation to the stimulus.^{11,12}
- Main outcome (QDSA) is well validated but allodynography and Rainbow Pain Scale require psychometric evaluation.
- Retrospective and uncontrolled cohort study provides preliminary/limited evidence for the effectiveness of the somatosensory rehabilitation method but suggests more research is warranted.

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