**Psychological Pain Treatment in Fibromyalgia: Systolic Extinction Training (SET) Restores Baroreflex Sensitivity, Reduces Pain Sensitivity and Clinical Pain Report**

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**Introduction.**

Important components of intrinsic pain regulatory systems are modulated by cardiovascular dynamics that influence barorereflex sensitivity (BRS). The present study evaluated the effects of extinction training combined with electrical stimulation administered either to the systemic or diastolic phases of the cardiac cycle delivered in a randomized order (“systolic extinction training”, SET) in patients with fibromyalgia syndrome (FMS). SET was compared to treatment with extinction training combined with electrical stimulation delivered independent of the cardiac cycle a “placebo” condition (PC).

**Method.**

Forty patients who fulfilled the American College of Rheumatology criteria for FMS and showed an elevated blood pressure response to a laboratory stressor termed hypertensive stress reactivity were randomly assigned to SET (n = 20), or PC (n = 20). Assessments of clinical pain, pain threshold, pain tolerance, baroreflex sensitivity (BRS), blood pressure and heart rate, cognitive and behavioural variables as well as sleep architecture and sympathetic outflow were measured pre-treatment and post-treatment as well as 6 to 12 months posttreatment.

**Design of Systolic Extinction Training - SET**

10 Sessions with 2 hours in 5 weeks

**Results.**

Both sensory and pain threshold as well as pain tolerance increased significantly immediately and 6-12 months after SET.

The pain reduction was associated with a significant increase in BRS.

The remission of Clinical Pain was associated with a significant decrease in Blood Pressure, and an increase in EMG and Physical Activity measured in MPT (all P<0.001).

In addition, the SET group demonstrated statistically significant higher improvements in central functions (all P<0.001) as well as an improvement in sleep architecture (P<0.001) and a reduction in sympathetic outflow (P<0.001) compared to the PC group.

**Conclusion.**

These results suggest that SET is effective in treating patients with FMS producing long-lasting pain remission. Furthermore, the findings show that the [1] greater blood pressure responses to stress predict a greater reduction in clinical pain report and [2] increase in physical activity observed following SET is associated with a restoration of BRS, cortical pain inhibition, sympathetic outflow and sleep architecture. Even though baseline BRS is diminished in FMS patients, electrical stimulation delivered in a manner dependent on the cardiac cycle phase when combined with extinction training is highly effective in reducing pain and restoring functions in a FMS subgroup characterized by hypertensive blood pressure stress reactivity.

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Figure 1. Design of SET

Figure 2. Changes of clinical pain immediately and 6-12 months after SET and PC

Figure 3. Changes of sensory, pain thresholds and pain tolerance immediately and 6 and 12 months after SET

Figure 4. Changes of BRS immediately and 6-12 months after SET and PC

Figure 5. Changes in blood pressure, EMG and physical activity after SET and PC

Figure 6. Decrease of the sympathetic outflow after SET

Figure 7. Restoration of sleep architecture after SET