Psychological Pain Treatment in Fibromyalgia: Systolic Extinction Training (SET) and Cardiovascular Training restores Baroreflex Sensitivity, reduces Pain Sensitivity and Clinical Pain Report

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T. Meller[1], MA, S. Wolf[1], BSc, R. Malinowski[1], MA, W. Maixner[2], PhD, R. H. Gracely[2], PhD & K. Thieme[1], PhD

[1]Psychological Med., Philipps Univ. Marburg, Marburg, Germany, [2]Ctr. for Pain Res. and Innovation, Univ. of North Carolina, Chapel Hill, NC, USA

Introduction Important components of intrinsic pain regulatory systems are modulated by cardiovascular dynamics that influence baroreceptor sensitivity (**BRS**). The present study evaluated the effects of extinction training combined with electrical stimulation administered during either the systolic or diastolic phase of the cardiac cycle ("systolic extinction training", **SET**) in patients with fibromyalgia syndrome (**FMS**). SET was compared to cardiovascular training (**CVT**) combined with the same electrical stimulation.

Methods 35 FMS patients with an elevated blood pressure response to laboratory stressors were randomly assigned to either **SET** (n = 20), or **CVT** (n = 15). Clinical pain, sensory, pain and tolerance thresholds, psychophysiological measures and EEG components (N50, N150, P260, P390) were assessed pre- and post-treatment.

Therapeutic Design Patients in each group received **10 sessions over five weeks** (2/week). Each session combined electrical stimulation (see *Fig1*) with:

- **SET** 50 min of psychological *Extinction Training* (perception training, increasing physical activity and self-assertiveness)
- **CVT** 30 min of mild cardiovascular workout on a bicycle ergometer, instructed by a trained physiotherapist.

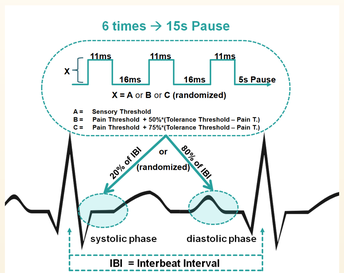

Fig. 1. Individually adjusted stimuli of three different intensities are administered during either the systolic or diastolic phase of the cardiac cycle.

Results 1 – Clinical Pain & Thresholds Only SET but not CVT showed a significant effect on clinical pain intensity, whereas all thresholds significantly increased in both groups (all Ps < 0.01).

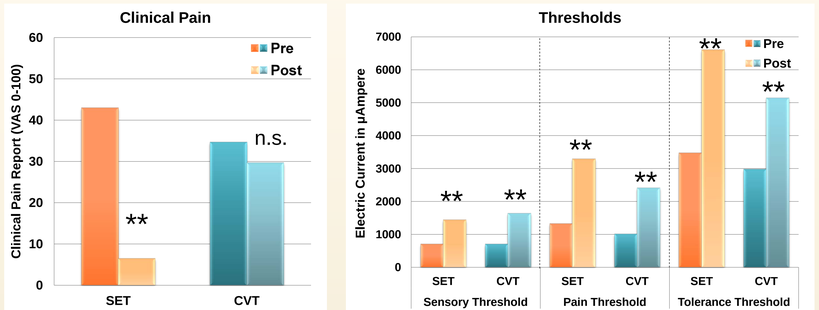

Fig. 2. Clinical pain report (left) and individual sensory, pain and tolerance thresholds (right) before and after training for SET and CVT group.

Results 2 – Baroreflex Sensitivity Both SET and CVT patients show a significant increase in BRS (PRSA) after training (all Ps < 0.05).

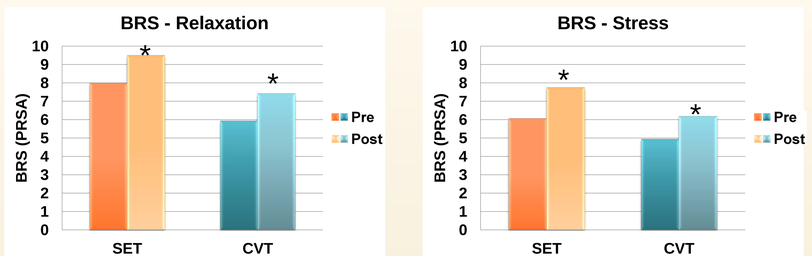

Fig. 3. Mean BRS (PRSA) for relaxation (left) and stress phases (right) before and after training for SET and CVT group.

Results 3 – EEG Components SET as well as CVT patients show changes in cortical pain processing after training as indicated by changes in early and late EEG components (N50, N150, P260, P390), with greater effects for SET.

Fig. 4. Stimulus evoked potentials before (left) and after (right) training for SET and CVT in electrode C4 after administration of electrical stimulus, different lines indicate different stimulus intensities.

Conclusions These data suggest that cardiac gating of peripheral afferent stimulation may result in long lasting pain remission if it is combined with an effective behavioral treatment but not if combined with physical training only. We conclude that **SET** activates both sensory and cognitive-affective brain regions involved in pain inhibition while **CVT** seems to activate sensory brain regions only, and therefore – in contrast to **SET** – fails to re-establish functionality of intrinsic pain inhibition mechanisms.

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Contact: Dipl.-Psych. Tina Meller, Philipps University of Marburg, tina.meller@staff.uni-marburg.de