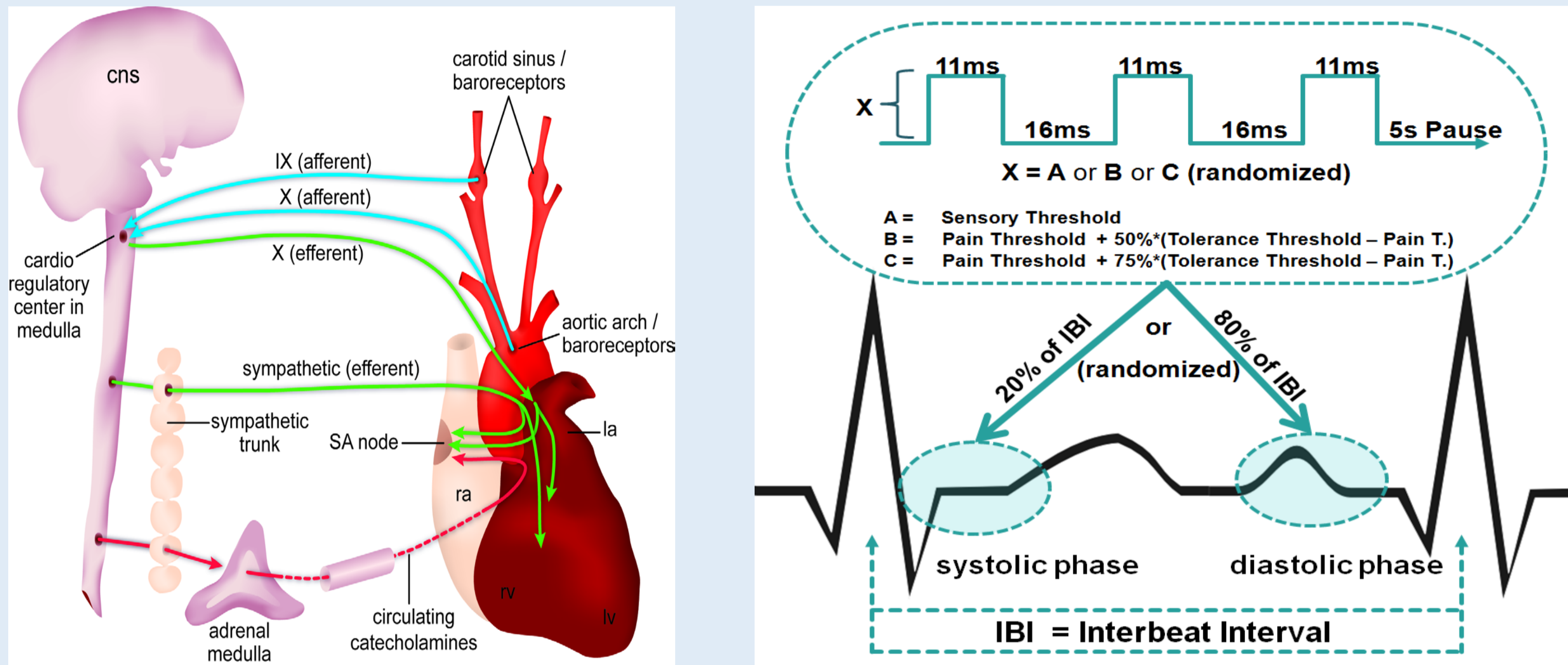


T. Meller<sup>1</sup>, MA, R. Malinowski<sup>1</sup>, MA, & K. Thieme<sup>1</sup>, PhD

<sup>1</sup>Medical Psychology, Philipps University of Marburg, Marburg, Germany

**Background.** Fibromyalgia (FM) patients show heterogeneous stress responses associated with psychological characteristics. The largest patient subgroup is characterized by a hypertensive stress response and high levels of pain, physical impairment, catastrophizing and anxiety. This relationship between psychological and psychophysiological variables may be related to diminished baroreflex sensitivity (BRS) as part of dorsal medial nucleus tractus solitarius (dmNTS) reflex arcs. Baroreceptors relay cardiovascular output to dmNTS, which regulates pain, sleep, anxiety, and blood pressure via projections to other areas in the brain stem and pain network.



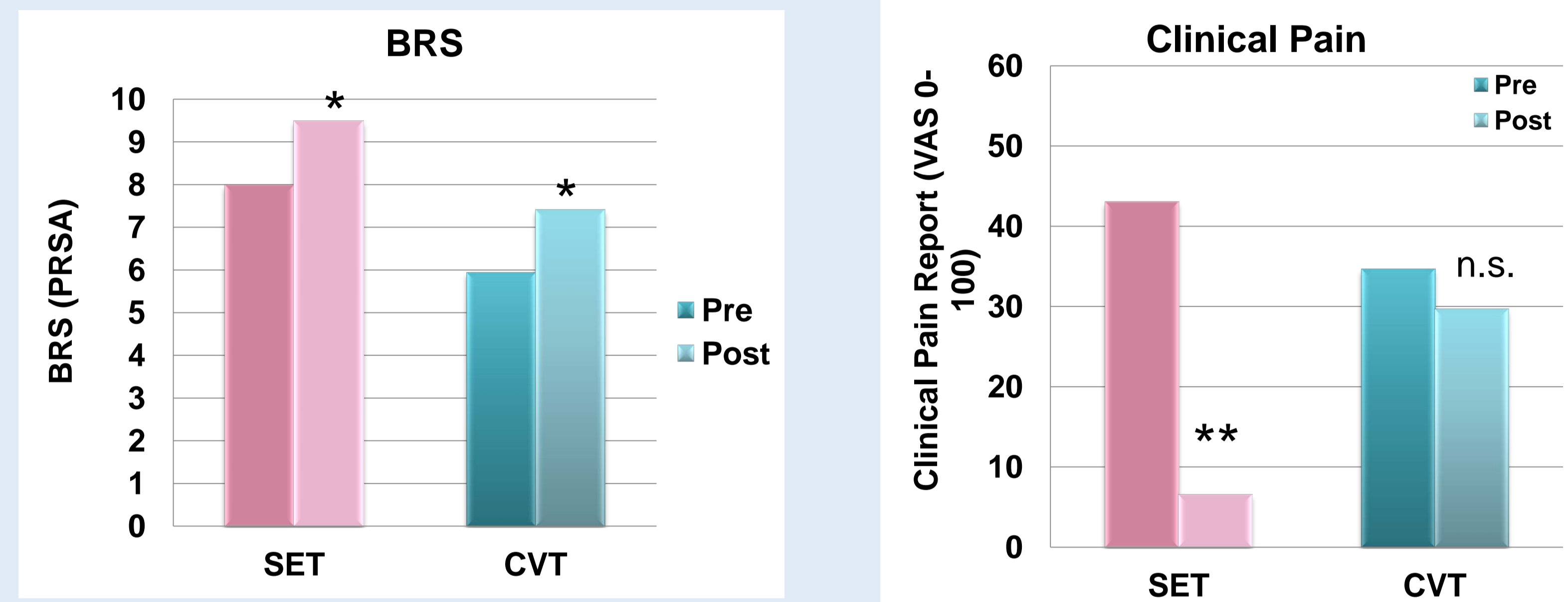
**Fig. 1.** Sympathetic & parasympathetic regulation of the baroreceptor reflex (left, McNeill et al., 2010) and schematic display of SET stimulation protocol (right).

We have previously shown that the diminished BRS in FM can be increased through systolic extinction training (SET), a combination of operant behavioral treatment and cardiac dependent individualized peripheral electrical stimulation.

**Aim.** The present study investigates the relationship between physiological (BRS) and psychological (interference, catastrophizing, coping, anxiety, physical activity) variables in the context of pain regulation.

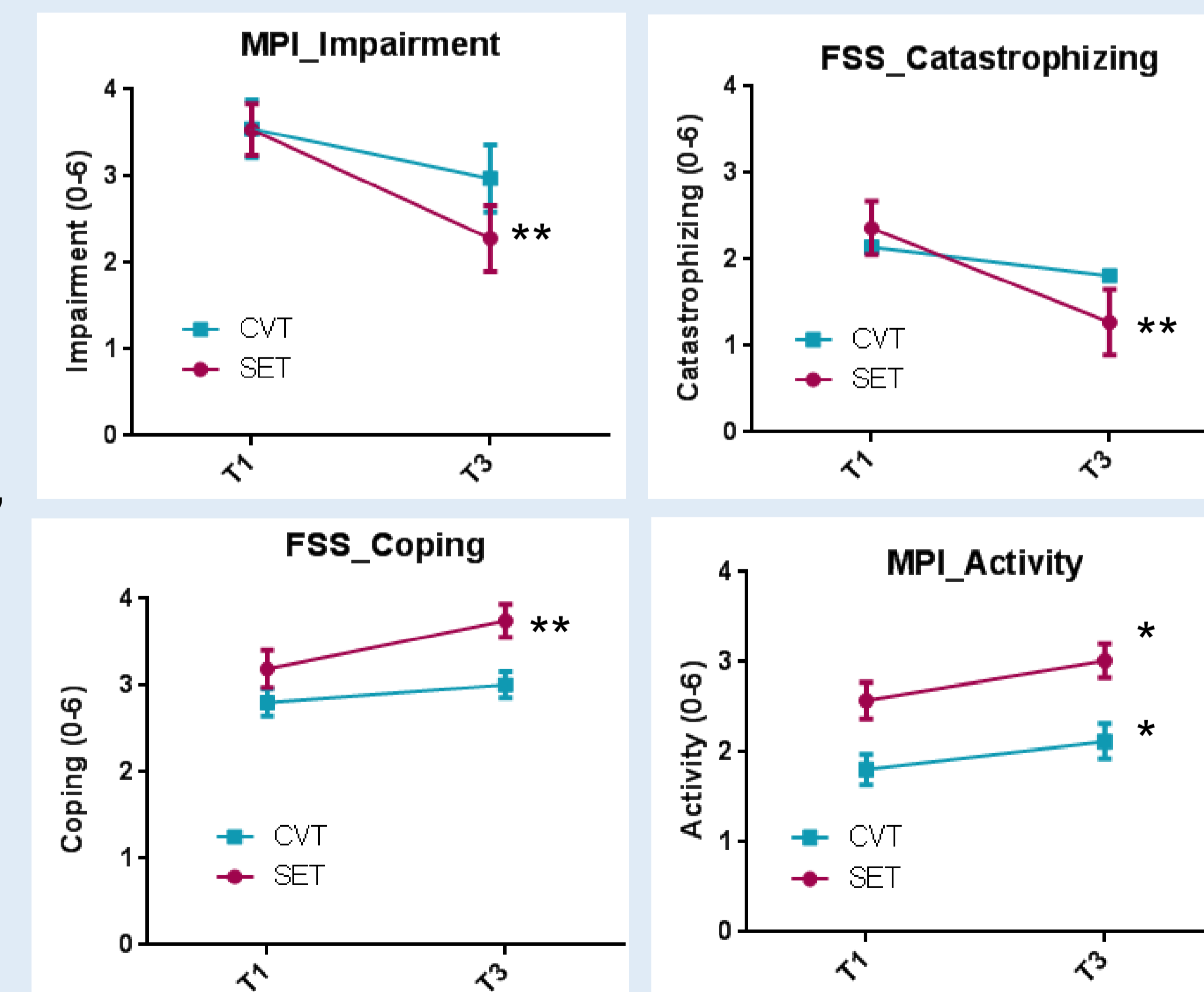
**Methods.** In a randomized study 45 FM patients who both met the American College of Rheumatology criteria for FM responded to laboratory stress with elevated blood pressure, were assigned to either SET (n=30) or cardiovascular training (CVT, n=15) combined with individualized electrical stimulation dependent on the cardiac cycle. Clinical pain, BRS, and standardized psychological questionnaires were assessed before (T1), after (T2) and 6-12 months after treatment (T3).

**Results 1 – Clinical Pain & BRS.** Only SET but not CVT shows a significant effect on clinical pain ( $p < .01$ ) with a remission in 82% at T3. Both groups show increases in BRS ( $p < .05$ ) and sensory, pain and tolerance thresholds to electrical stimuli ( $p < .01$ ) at T3.



**Fig. 2.** BRS - Baroreflex sensitivity (left) and Clinical Pain ratings (right) before and after treatment.

**Results 2 – Psychological Variables.** Only after SET, patients showed significantly reduced interference (MPI), reduced catastrophizing (FSS) and increased active coping (FSS) (all  $p$ 's  $< .01$ ) vs CVT. However, both SET and CVT showed increased physical activity (MPI,  $p < .05$ ).



**Fig. 3.** Changes in the psychological variables interference, catastrophizing, active coping and physical activity.

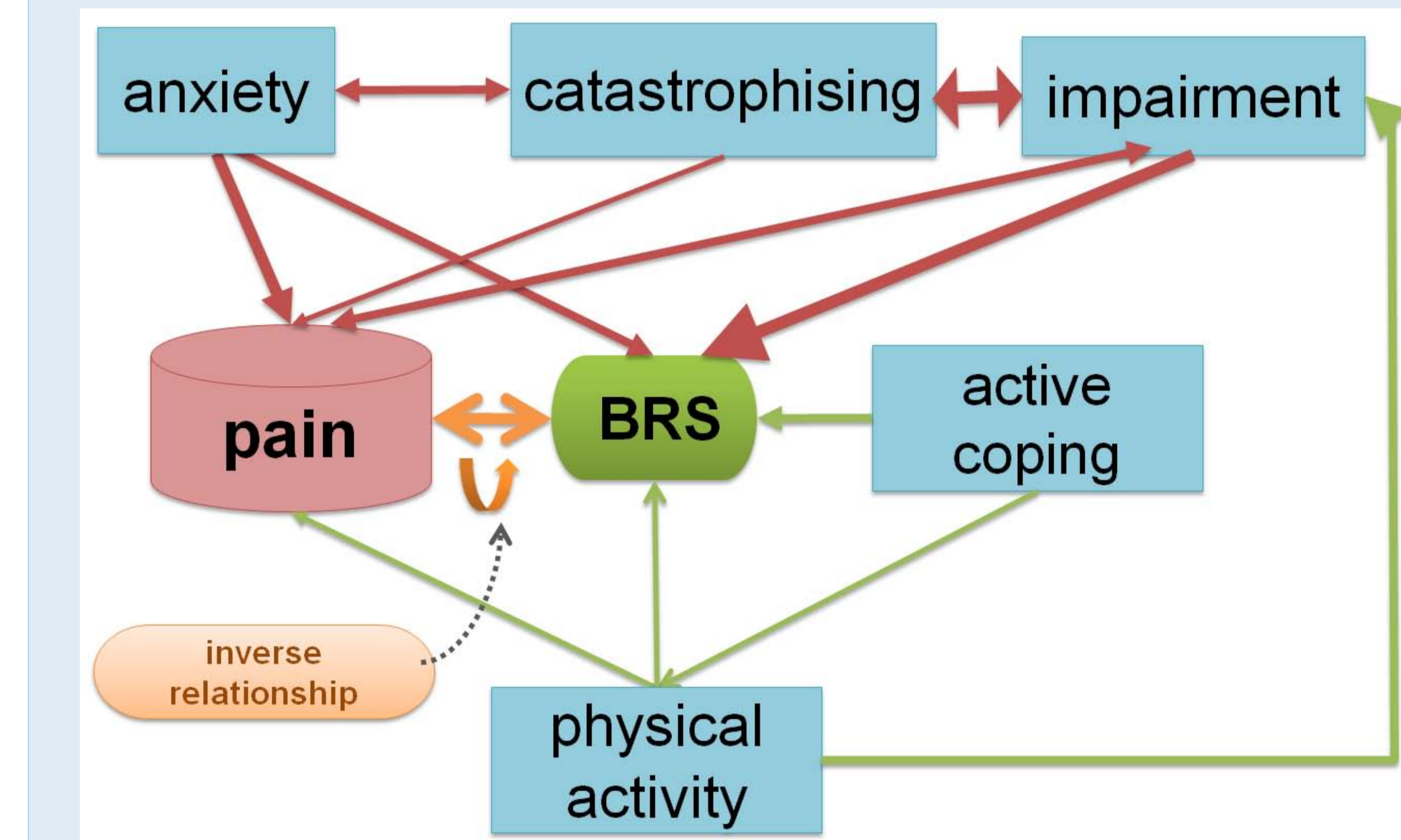
\*  $p < 0.05$  \*\*  $p < 0.01$

**Results 3 – Interaction of BRS and psychological variables.**

**Table 1.** Correlation of BRS and psychological variables.

	Pain Intensity		Impairment		Activity		Catastroph.		Active Coping		Anxiety	
	r	p	r	p	r	p	r	p	r	p	r	p
Pain Intensity												
Impairment	.723	<.000										
Activity	-.349	.032	-.344	.035								
Catastrophizing	.692	<.000	.793	<.000	n.s.							
Active Coping	n.s.		n.s.		.518	<.001	n.s.					
BRS	-.569	.002	-.472	.011	.607	<.001	n.s.		.394	.042	-.418	.027

**Proposed Interaction.** In accordance with current literature and with our own findings, we propose the following interactional relationships between BRS and key psychological variables:



**Fig. 4.** Interactions between BRS and psychological variables in FM.

**Conclusion.** These data suggest that only SET, but not CVT, is able to re-establish intrinsic pain regulatory mechanisms. SET affects sensory, cognitive, affective, and behavioral components of pain processing whereas CVT seems to only affect the sensory component. These mechanisms help identify pathways that contribute to the autonomic and stress mechanisms in the dmNTS reflex arcs that mediate chronic pain.