

Emotional Response of Cold-Pressor: an Autonomic Outlook

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Background: Many psychological variables bear upon pain, in particular emotional aspects which play a major role. The cold pressor test (CPT) constitutes an empirically validated pain-induction technique. Better emotional repair purportedly allows less sensory pain while undergoing CPT (in women according to [1]). The autonomic nervous system (ANS) activity is modernly considered as a major component of the emotional response.

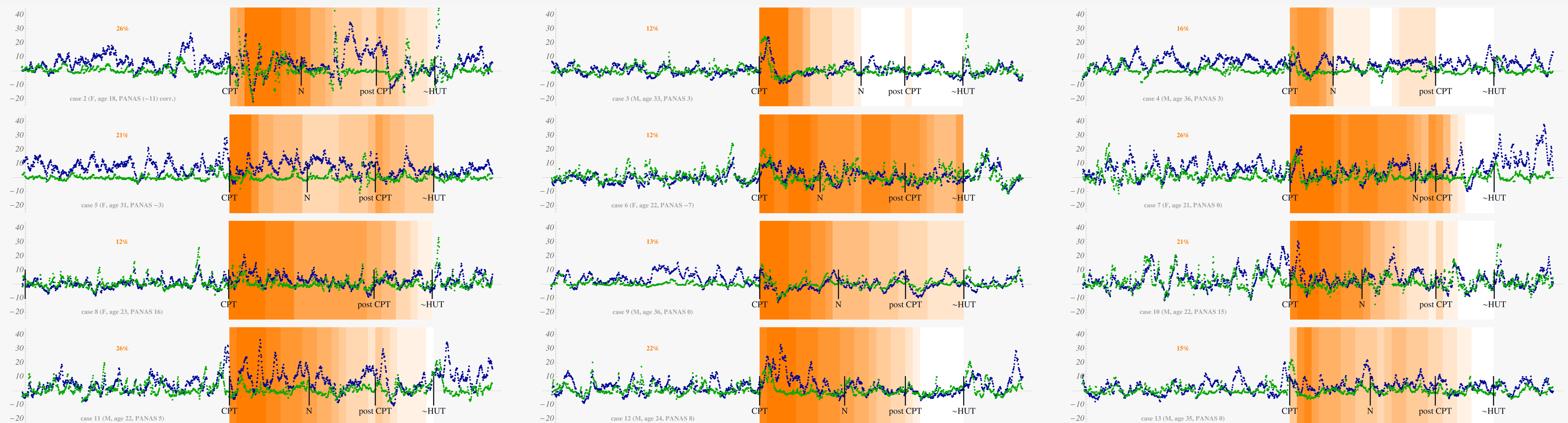
Objective: We propose to explore the various emotional facets of acute pain from a cardiac autonomic standpoint. The variability in experiencing CPT across a mixed-gender population is regarded according to ANS changes.

Methods: 13 healthy volunteers (5 women, 8 men), age ranging from 18 to 36 years, underwent a 5 minutes CPT with hand immersion in ice-cold water. Electrocardiographic (EKG) signal was recorded throughout the experiment, both during, ante- and post-CPT. Subjects were supine tested for normal autonomic function during 7 minutes; autonomic dysfunction (using ANSscope of Dyansysis, Inc.) varied from 12 to 26%, much below the 41% abnormality threshold. During the CPT, participants rated their perception of the sensory and affective pain, every 15 seconds, using a numerical rating scale, ranging from 0 to 10. Emotional variations were evaluated by the investigator using Positive and Negative Affect Schedule (PANAS) before and in the 2 minutes post-CPT. The subjects were then asked to stand, in order to measure their cardiac response to orthostatic stress. The ANSscope was used to monitor beat-to-beat ANS changes extracted from the EKG recordings.

Results: 12 out of 13 cases showed a systemic sympathetic local activation associated with the highest level of perceived pain. However, both the timings of acute pain and of numbness varied considerably across subjects. Of 9(+1) cases which presented vagal co-activation during the CPT, at least two women and four men combined a strong parasympathetic activation with the sympathetic drive during the final orthostatic test. These 6(+2) cases were found to have the best emotional repair according to their PANAS scores before and after the CPT.

Conclusions: Though we found no universal autonomic response to CPT, we cautiously (population size should be increased to allow proper statistical testing) observed a vagal origin to the equivalence between good emotional regulation and good coping with pain, regardless of gender.

[1] Ruiz-Aranda D, Salguero JM, Fernández-Berrocal P, Emotional Regulation and Acute Pain Perception in Women. J Pain 11:564-569, 2010



12 cases chart with indications for gender, age, PANAS post- and pre-CPT difference score, autonomic dysfunction (orange %), sympathetic and parasympathetic descriptors (respectively, blue and green dots), pain scale (shades of orange). The N marker indicates numbness while HUT refers to the final standing test.