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The Journal of Pain

Volume 9, Issue 2, February 2008, Pages 122-145

Focus article

Pain and Stress in a Systems Perspective: Reciprocal Neural, Endocrine, and Immune Interactions

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<https://doi.org/10.1016/j.jpain.2007.09.006>

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Abstract

This paper advances a psychophysiological systems view of pain in which physical injury, or wounding, generates a complex stress response that extends beyond the nervous system and contributes to the experience of pain. Through a common chemical language comprising neurotransmitters, peptides, endocannabinoids, cytokines, and hormones, an ensemble of interdependent nervous, endocrine, and immune processes operates in concert to cope with the injury. These processes act as a single agent and comprise a supersystem. Acute pain in its multiple dimensions, and the related symptoms that commonly occur with it, are products of the supersystem. Chronic pain can develop as a result of unusual stress. Social stressors can compound the stress resulting from a wound or act alone to dysregulate the supersystem. When the

supersystem suffers dysregulation, health, function, and sense of well-being suffer. Some chronic pain conditions are the product of supersystem dysregulation. Individuals vary and are vulnerable to dysregulation and dysfunction in particular organ systems due to the unique interactions of genetic, epigenetic and environmental factors, as well as the past experiences that characterize each person.

Perspective

Acute tissue injury activates an ensemble of interdependent nervous, endocrine, and immune processes that operate in concert and comprise a supersystem. Some chronic pain conditions result from supersystem dysregulation. Individuals vary and are vulnerable to dysregulation due to the unique interactions of genetic, epigenetic, and environmental factors and past experiences that characterize each person. This perspective can potentially assist clinicians in assessing and managing chronic pain patients.



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Key words

Pain; stress; allostasis; complex adaptive system; hypothalamo-pituitary-adrenocortical axis

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Supported by a grant to the first author from the National Institutes of Health, R01 CA074249.

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