Mass General Brigham

Human Performance Optimization and Recovery Science

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12 SEP 2024

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Conflict of interest

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Learning Objectives

1. Brain-Body Connection
2. Stress and Stressors
3. Recovery Science

Your Brain's perception is your Body's Reality: Brain-Body Connection

Allostatic Load

Neurocardiac

- ANS
- HR
- HRV

Psychotherapy and Psychosomatics

Standard Review Article

Psychother Psychosom 2021;90:11–27
DOI: 10.1159/000510696

Received: July 17, 2020
Accepted: August 6, 2020
Published online: August 14, 2020

Allostatic Load and Its Impact on Health: A Systematic Review

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Keywords
Allostatic load · Allostatic overload · Biomarkers · Clinimetrics · Diagnostic Criteria for Psychosomatic Research · Stress

Abstract
Introduction: Allostatic load refers to the cumulative burden of chronic stress and life events. It involves the interaction of different physiological systems at varying degrees of activity. When environmental challenges exceed the individual ability to cope, then allostatic overload ensues. Allostatic load is identified by the use of biomarkers and clinical criteria. ***Objectives:*** To summarize the current knowledge on allostatic load/overload and its impact on health, as well as clinical studies on consequences of allostatic load/overload on both physical and mental health across a variety of settings. ***Conclusions:*** The findings indicate that allostatic load and overload are associated with poorer health outcomes. Assessment of allostatic load provides support to the understanding of psychosocial determinants of health and lifestyle medicine. An integrated approach that includes both biological markers and clinimetric criteria is recommended.

Introduction

Your Brain's perception is your Body's Reality: Stress

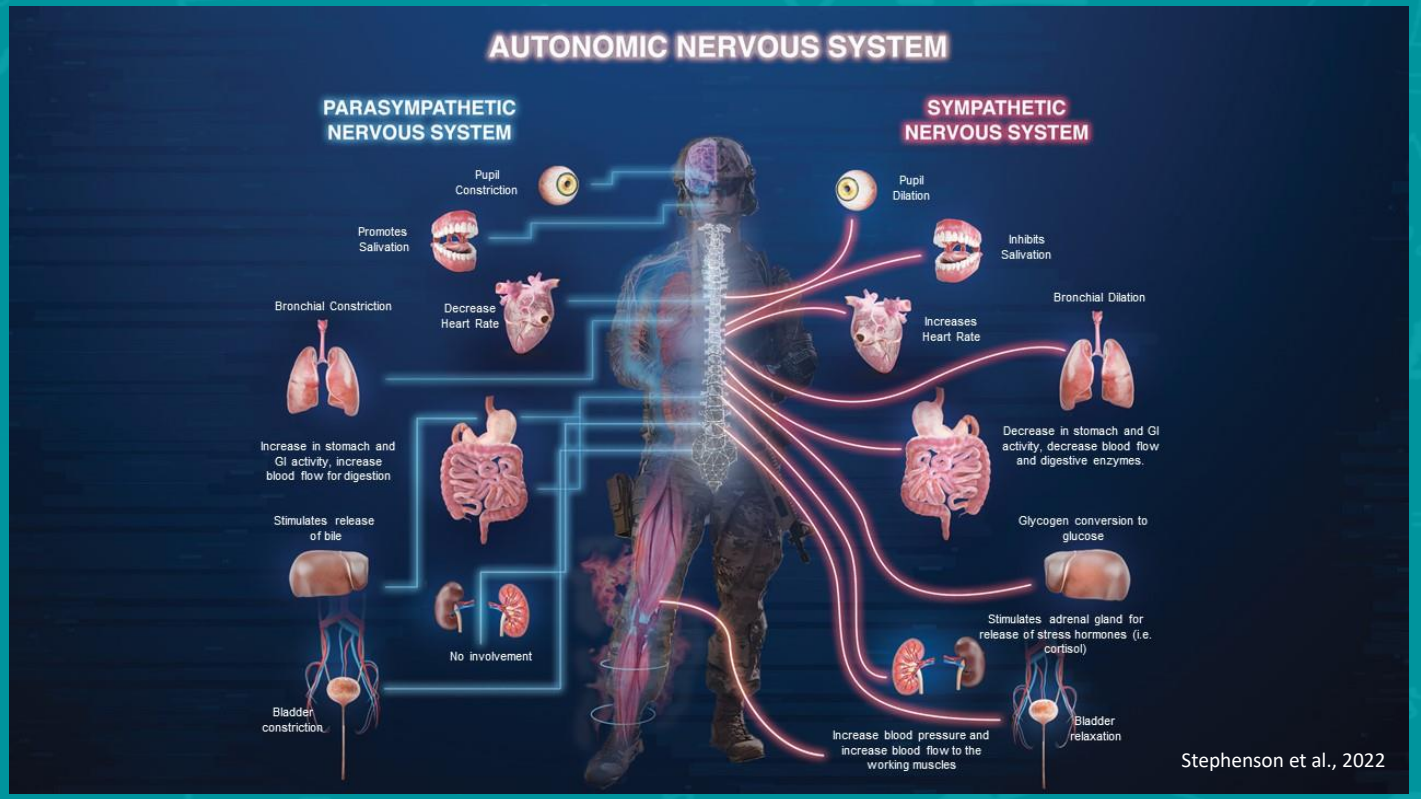
Acute Stress
Short-term disruption of homeostasis that may negatively impact physical and mental performance with no effect on wellness – *Stephenson et al, 2022 and Taverniers et al, 2011*

Chronic Stress
Long-term disruption of homeostasis resulting in behavioral and health issues – *Bertilsson et al, 2020*

Autonomic Nervous System

Parasympathetic
- **Relaxation**
- **Decreases Herat Rate**
- **Decreases Cortisol production**
- **Increases decision making ability**

Sympathetic
- **Fight or Flight**
- **Increases Herat Rate**
- **Increases Cortisol, adrenaline**
- **Decreases decision making (executive function)**



Stephenson et al., 2022

Recovery Science

$$\Omega / \xi = \Sigma$$

$$\frac{\text{Total Load}}{\text{Recovery}} = \text{Sustained Optimal Performance}$$

Recovery Science

- **Allostatic Overload**
- **Chronic Illness/Injury**
- **Occupation**
- **Family**
- **Environment**

Life events should be treated as a withdrawal.

You can only make so many withdrawals without making a deposit before your bank account is depleted.

An overdrawn bank account equates to poor health outcomes…

Recovery Science

Key Aspects

Repair

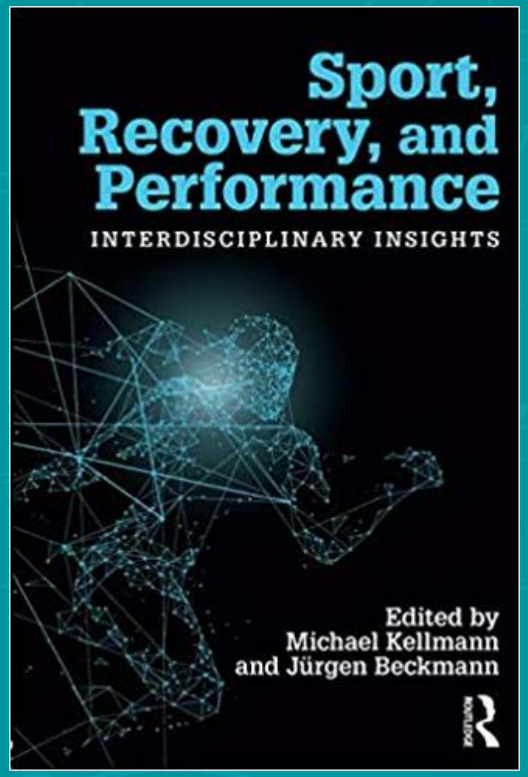
- Tissue, injury, illness, etc.
- Reset dysfunctions – HPA, CNS, ANS, etc.
- Glymphatic system

Replenish

- Cellular (mitochondria)
- Sleep
- Nutrition
- Hydration

Recover

- Return to a state of *physical & mental* readiness



Recovery Technologies

Float Tanks

R.E.S.T. - Restricted Environmental Stimulation Technique

- **Decrease brain wave frequencies – theta & delta**
- **Increases HRV**
- **Increase in Sleep Quality**
- **Balanced Autonomic Nervous System**
- **Enhances recovery**
- **Enhancement of Glymphatic System?**

Feinstein et al., 2018

Photobiomodulation

Whole Body PBM

Use of low-level light therapy to promote tissue healing. PBM used at a specific light spectrum of 600nm – 860nm is most effective in regeneration of the mitochondria. This spectrum is known as the Red and Near-infrared light.

- **Increase in mitochondrial regeneration**
- **?Aerobic/Anaerobic**
- **? ANS response**
- **? Cognitive recovery**

Forsey et al., 2023

Mass General Brigham Sports Medicine

Photobiomodulation

Transcranial PBM

tPBM targets the brain

- **major depressive disorder**
- **Post Traumatic Stress**
- **TBI**
- **? Sleep Quality**

Cognition

Brain Photobiomodulation Therapy: a Narrative Review
Department of Medical Physics, Tabriz University of Medical Sciences : [Link]

Psychological benefits with near infrared light to the forehead: a pilot study on depression
The Department of Psychiatry, Harvard Medical School and the Laboratory for Psychiatric Biostatistics, McLean Hospital : [Link]

Cognitive Enhancement by Transcranial Photobiomodulation Is Associated With Cerebrovascular Oxygenation of the Prefrontal Cortex
Department of Psychology, Institute for Neuroscience, University of Texas : [Link]

Transcranial Photobiomodulation For The Management Of Depression: Current Perspectives
Department of Psychiatry, NYU Langone School of Medicine, New York, NY, USA : [Link]

Increased Functional Connectivity Within Intrinsic Neural Networks in Chronic Stroke Following Treatment With Red/Near-Infrared Transcranial Photobiomodulation
Boston University School of Medicine, Harvard Medical School : [Link]

Review of transcranial photobiomodulation for major depressive disorder: targeting brain metabolism, inflammation, oxidative stress, and neurogenesis
Wellman Center for Photomedicine, Massachusetts General Hospital : [Link]

Shining light on the head : Photobiomodulation for brain disorders
Wellman Center for Photomedicine, Massachusetts General Hospital : [Link]

Improved cognitive function after transcranial, light-emitting diode treatments in chronic, traumatic brain injury: two case reports
Boston University, School of Medicine : [Link]

Augmentation of cognitive brain functions with transcranial lasers
Department of Psychology and Institute for Neuroscience, University of Texas : [Link]

Neurological and psychological applications of transcranial lasers and LEDs
Department of Neurology and Neurotherapeutics, University of Texas : [Link]

Cryostimulation

Whole Body Cryostimulation

Use of extreme cold exposure to promote resynchronization. The body is ex[posed to extreme temperatures of -160^0 F to -320^0 F for up to 3 minute. This triggers a primal response in the brain, causing a cascade of physiological mechanisms for survival. Increase in mitochondrial regeneration

- **Endocrine response (HPA Axis)**
- **ANS response**
- **? Cognitive recovery**

Stanek et al. 2020

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Thank you!

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