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On the Neuro-Fascial Interface: An Empirical Synthesis of Experimental and Clinical Evidence regarding the Role of Vagal Tone in Exercise Oncology

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Background: Modern oncology excels in targeting tumor biology yet often struggles to quantify the "non-molecular" impact of psychological states on disease progression and recovery. While George Engel's biopsychosocial model challenges this reductionism since 50 years, the precise physiological mechanisms linking socio-emotional distress for example to the tumor microenvironment - and conversely, tissue states to behavioral patterns - still remain underexplored in standard oncological care. This presentation addresses this gap by examining the neuro-fascial interface and exercise oncology as an effective mediator between socio-emotional states and somatic oncology.

Theoretical Framework: Building on the theoretical framework of the Neurovisceral Integration Model (NIM), we outline the physiological cascade whereby socio-emotional states can modulate peripheral homeostasis, fascial tissue, and organ functioning. Central to this framework is the vagus nerve, which mediates "top-down" regulation of organ function; vagal withdrawal impairs the Cholinergic Anti-inflammatory Pathway (CAIP), promoting a pro-inflammatory fascial microenvironment. Crucially, this axis is bidirectional: afferent signaling from inflamed, stiffened fascial tissue ("bottom-up") is implicated in perpetuating sickness behavior and Cancer-Related Fatigue (CRF).

Crucially, the NIM provides a unified framework for both pathogenic and salutogenic trajectories. Vagal tone, therefore, serves as a measurable proxy for the organism's regulatory capacity. Consequently, 'pro-vagal interventions' enhance this competence on a systemic level. Hence, the NIM framework and its described mechanism supports a multimodal approach, integrating movement, respiratory modulation, and metabolic control across the entire cancer continuum (prehabilitation through survivorship).

Outlook: This contribution serves as a theoretical synthesis, integrating robust evidence from animal models, human studies, clinical trials and meta-analyses. It establishes a mechanistic foundation for future research in exercise oncology by elucidating the reciprocal causality between physiology, immunology and disease progression. We propose that both, exercise and fascia can act as a critical regulator within this framework, offering a physiological lever to improve cancer-related outcomes.

Keywords

Neuro-Visceral integration, Cholinergic Anti-inflammatory Pathway, Biopsychosocial Model, Heart Rate Variability

Conflict of Interest & Ethical Approval

yes

Abstract submitters declaration

yes

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