Cardiovascular and Cardiorespiratory Interactions – From Physiological Mechanisms to Clinical Applications
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Interactions in a Selected Four-Node Network of Cardiorespiratory Parameters

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joint work with Laura Sparacino[1], Chiara Barà[2,3], Luca Faes[2]

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This study introduces a network-based view of the spontaneous short-term regulatory mechanisms linking cardiovascular and cardiorespiratory systems across physiological states. Using conditional transfer entropy, we assessed directed interactions among beat-to-beat heart period, arterial pressure, respiration, and arterial compliance variability in 39 healthy subjects during supine rest and orthostatic stress. The analysis confirmed established effects (e.g., reduced respiratory sinus arrhythmia during tilt and increased baroreflex) and revealed additional, less studied compliance-related pathways: tilt-linked changes included weaker influences of heart period and arterial pressure on compliance, stronger causal effects from compliance to arterial pressure, and reduced compliance effects on respiration. By combining model-based and model-free methods, we also identified whether interactions were linear or nonlinear. Overall, the findings highlight arterial compliance as a key driver of cardiovascular coupling and support using direct causality measures to capture the complex origins of short-term cardiovascular oscillations.