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Cardiac Vagal Tone and Processing Speed in Visuospatial Working Memory

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Abstract

Working memory (WM) performance reflects both cognitive architecture and physiological self-regulation. Grounded in Neurovisceral Integration Theory, this study examined the association between cardiac vagal tone and WM dynamics using the Adaptive Composite Complex Span (ACCES). A sample of 101 university students completed a 5-minute resting basal lnRMSSD assessment and adaptive tasks measuring verbal, mathematical, and visuospatial WM. Correlational analyses revealed that processing accuracy was associated with storage capacity across modalities for the Symmetry Span ($r = .420$, $p < .001$). Higher HRV was selectively linked to faster visuospatial processing speed. Group comparisons confirmed that participants with higher HRV exhibited Symmetry Span processing significantly faster than those with lower HRV ($t(56) = 2.22$, $p = .030$, $d = 0.59$). These findings identify autonomic flexibility as a meaningful constraint on the temporal efficiency of executive control, advancing an embodied perspective on working memory.