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# Orienting in a defensive world: Mammalian modifications of our evolutionary heritage. A Polyvagal Theory

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## Abstract

The vagus, the 10th cranial nerve, contains pathways that contribute to the regulation of the internal viscera, including the heart. Vagal efferent fibers do not originate in a common brainstem structure. The Polyvagal Theory is introduced to explain the different functions of the two primary medullary source nuclei of the vagus: the nucleus ambiguus (NA) and the dorsal motor nucleus (DMNX). Although vagal pathways from both nuclei terminate on the sinoatrial node, it is argued that the fibers originating in NA are uniquely responsible for respiratory sinus arrhythmia (RSA). Divergent shifts in RSA and heart rate are explained by independent actions of DMNX and NA. The theory emphasizes a phylogenetic perspective and speculates that mammalian, but not reptilian, brainstem organization is characterized by a ventral vagal complex (including NA) related to processes associated with attention, motion, emotion, and communication. Various clinical disorders, such as sudden infant death syndrome and asthma, may be related to the competition between DMNX and NA.

**Descriptors:** Vagus, Vagal tone, Nucleus ambiguus, Dorsal motor nucleus of the vagus, Respiratory sinus arrhythmia, Polyvagal Theory

The systematic investigation of mind–body relations forms the scientific basis for the science of psychophysiology. Unlike the correlative view of mind–body evaluations that dominates psychology and psychiatry, psychophysiology emphasizes a continuity between neurophysiological and psychological processing. Psychophysiologicalists assume that the nervous system provides the functional units for the bidirectional transduction of psychological and physiological processes. Thus, from a psychophysiological perspective, it is possible to link psychological

processes with neurophysiological processes and brain structures by measurement and not just theory.

This paper will focus on neural regulation of the heart by the vagus and how this regulation evolved to facilitate specific psychological processes. The Polyvagal Theory, as described in this paper, provides an explanation of how the vagal pathways regulate heart rate in response to novelty and to a variety of stressors. The theory proposes that through evolution mammals developed two vagal systems: a phylogenetic relic of amphibia and reptilia

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