

# Sleep Deprivation Impairs the Human Central and Peripheral Nervous System Discrimination of Social Threat

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## Abstract

Facial expressions represent one of the most salient cues in our environment. They communicate the affective state and intent of an individual and, if interpreted correctly, adaptively influence the behavior of others in return. Processing of such affective stimuli is known to require reciprocal signaling between central viscerosensory brain regions and peripheral-autonomic body systems, culminating in accurate emotion discrimination. Despite emerging links between sleep and affective regulation, the impact of sleep loss on the discrimination of complex social emotions within and between the CNS and PNS remains unknown. Here, we demonstrate in humans that sleep deprivation impairs both viscerosensory brain (anterior insula, anterior cingulate cortex, amygdala) and autonomic-cardiac discrimination of threatening from affiliative facial cues. Moreover, sleep deprivation significantly degrades the normally reciprocal associations between these central and peripheral emotion-signaling systems, most prominent at the level of cardiac-amygdala coupling. In addition, REM sleep physiology across the sleep-rested night significantly predicts the next-day success of emotional discrimination within this viscerosensory network across individuals, suggesting a role for REM sleep in affective brain recalibration. Together, these findings establish that sleep deprivation compromises the faithful signaling of, and the “embodied” reciprocity between, viscerosensory brain and peripheral autonomic body processing of complex social signals. Such impairments hold ecological relevance in professional contexts in which the need for accurate interpretation of social cues is paramount yet insufficient sleep is pervasive.