The Impact of Sleep Deprivation on Acute Stress and Emotional Reactivity

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Sleep plays an integral role in health and functioning. Sleep deprivation (SD) adversely affects systemic functions as diverse as the immune system, endocrine activity, and glucose metabolism. The most well documented effects of SD in humans are those on neurobehavioral function. The brain regions most sensitive to sleep loss are the prefrontal cortex (PFC), with corresponding impairments observed in PFC-associated executive functions. Even brief periods of SD are associated with impaired vigilance and cognition. However, another prominent effect of SD—the adverse impact of AD on mood and emotion (affect) regulation—has been less thoroughly explored in the experimental literature. SD is likely to have an impact of emotional function, given that the PFC is strongly interconnected with brain structures linked to affect, such as the amygdala. Conceivably, functional impairments in both cognition and affect associated with SD would have negative repercussions for a sleep deprived individual when faced with environmental challenges that lead to stress. Stress increases inflammatory processes, and has adverse effects on cardiovascular and immunological function. SD is also associated with proinflammatory responses, cardiovascular and immune system dysfunction, and emotional dysregulation. Understanding relationships between sleep, emotion regulation, and stress may reveal important pathways by which sleep disturbances lead to psychiatric disorders and other medical morbidities. The general aims of this project are to examine the additive, synergistic effects of sleep deprivation and stress, and to explore mind-body relationships between stress reactivity and emotional reactivity. SD can be employed under strict experimental control conditions, and offers a unique model to probe mind-body interactions involved in the generation of and recovery from stress. A two-condition (normal sleep, sleep deprivation) within-subject randomized crossover design will be used to assess the influence of SD on emotional reactivity and stress reactivity in healthy young adults. Stress reactivity will be examined by assessing physiological reactions to an acute stressor. Cardiovascular (blood pressure, heart rate variability), proinflammatory (the cytokine Interlukin- and C-Reactive Protein), and hormonal (cortisol) responses to psychological stress will be examined. The time course of psychophysiological reactivity (pupil dilation and heart rate variability) responses to emotional pictures and sounds using methods previously developed and tested in sleep deprived individuals will be used to examine emotional reactivity.