CONTRIBUTIONS OF NREM AND REM SLEEP TO EMOTION REGULATION: A SLEEP MICROSTRUCTURE-LEVEL STUDY

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Background: Sleep is increasingly recognized as a key biological mechanism supporting emotion regulation, yet the respective contributions of NREM and REM sleep remain unclear.

Aims: Building on the sequential hypothesis, we investigated whether a sequential organization underlies sleep-dependent recalibration of emotional responses to negative stimuli.

Methods: Healthy young adults completed three laboratory nights: one adaptation night and two experimental nights (emotional vs neutral), in counterbalanced order. On the emotional night, participants viewed a 24-min negative film excerpt before sleep; on the neutral night, they viewed a non-emotional documentary of matched duration. Subjective valence and arousal were assessed repeatedly using a digital analogue scale, and autonomic nervous system activity was continuously recorded during pre-sleep rest, film viewing, post-film recovery, nocturnal sleep, and post-sleep rest. Sleep was monitored with polysomnography, and N2/N3 spindles and REM sleep were automatically detected and quantified.

Results: Greater SWS and higher N2 spindle expression have been reported, associated with overnight reductions in autonomic and subjective indices of negative arousal after the emotional film. In addition, REM density showed a more complex, potentially detrimental relationship with emotional recalibration.

Conclusions: Together, these findings should clarify whether sleep-dependent emotion regulation relies on the sequential interplay between NREM and REM rather than on any single stage in isolation. This study extends the sequential hypothesis from memory to emotion, by demonstrating such a sequential architecture for emotion regulation would provide a mechanistic framework linking sleep architecture, autonomic physiology, and vulnerability to affective disorders.

Keywords: Sleep spindles, NREM sleep, REM sleep, REM density, Emotion regulation

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