THE ROLE OF VMPFC MODULATION DURING REM SLEEP IN FEAR EXTINCTION MEMORY CONSOLIDATION

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Grant 160/18

Background: Anxiety disorders (ADs) are among the most prevalent mental health conditions, yet first-line treatments often yield only moderate effectiveness. The fear conditioning paradigm is commonly used to investigate fear and extinction learning, revealing deficits in these processes and dysfunctional activity in the ventromedial prefrontal cortex (vmPFC) and amygdala in individuals with ADs. The vmPFC plays a critical role in regulating amygdala activity and consolidating fear extinction memory. Transcranial direct current stimulation (tDCS) has shown promise in enhancing fear extinction by modulating vmPFC activity. Additionally, rapid eye movement (REM) sleep may be crucial for fear extinction memory consolidation.

Aims: This study investigated the role of vmPFC activity during REM sleep in fear extinction memory consolidation.

Methods: Thirty-two participants underwent a three-day differential fear conditioning paradigm, with tDCS or sham stimulation applied over the vmPFC during REM sleep. Outcome measures included skin conductance responses (SCR) and subjective ratings of arousal, fear, and valence.

Results: tDCS during REM sleep enhanced fear extinction memory consolidation as measured by SCR. Participants also reported increased subjective arousal following tDCS compared to sham stimulation.

Conclusions: These findings suggest that tDCS applied during REM sleep may strengthen fear extinction memory, offering potential for improving exposure-based treatments for anxiety disorders.

Keywords: REM sleep, Fear extinction, Transcranial direct current stimulation, Ventromedial prefrontal cortex

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