

A PROMINENT ROLE FOR AMYGDALOID COMPLEXES IN THE VARIABILITY OF HEART RATE DURING RAPID EYE MOVEMENT (REM) SLEEP.

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BACKGROUND: Rapid eye movement sleep (REMS) is associated with intense neuronal activity, rapid eye movements, muscular atonia and dreaming. Another important feature in REMS is the instability in autonomous (in particular in cardiovascular) regulation. The neural mechanisms underpinning the variability in heart rate (VHR) during REMS are not known in detail, especially in humans. However, during wakefulness, it is known that the right insula plays a prominent role in cardio-vascular regulation.

METHODS: The analysis is based on 95 scans (54 scans in REMS and 41 during wakefulness) collected in 19 subjects in the framework of several positron emission tomography (PET) studies of human sleep conducted between 1997 and 2002, during which cerebral blood flow (CBF) was iteratively measured using the H₂¹⁵O infusion method. Complete polysomnographic recordings were obtained during the scanning sessions. Data analysis (SPM99) looked for the main effects of conditions (wake or REMS), VHR and for the condition by VHR interaction. Functional connectivity was characterized by psycho-physiological interactions ('physiological' factor : CBF in the amygdala; 'psychological' factor : REMS versus wakefulness).

RESULTS: The results show that in the right amygdaloid complex, the regional CBF is related to VHR more tightly during REMS than during wakefulness (significant condition x VHR interaction, $p < 0.05$ SVC corrected). Psychophysiological interactions show that the activity in the right insula was positively related to the amygdala during wakefulness but not during REMS.

CONCLUSION: Given the role of amygdala in the autonomous nervous system and in REMS, these findings suggest that the amygdala actively participates in the regulation of heart rate during REMS. The functional connectivity between the amygdala and the insular cortex, two brain areas involved in cardio-vascular regulation, differs significantly in REMS as compared to wakefulness.

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