Alpha and beta brain wave alterations and their association with attention and cognitive flexibility among healthy individuals following 18 to 24 hours of wakefulness period

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ABSTRACT

Introduction: The working environment today often demands prolonged periods of wakefulness. The recommended maximum duration of wakefulness daily is 17 hours. The impact of prolonged wakefulness on brain physiology can be observed through alpha and theta wave alterations on electroencephalography (EEG). However, the impact of these changes on cognitive flexibility and attention crucial for optimal functioning is still uncertain. **Methods:** We recruited 24 clinically-validated healthy subjects aged 18 to 60 years and subjected them to 18 to 24 hours of waking period. Stroop test and EEG were performed within 7 hours and after 18 to 24 hours of wakefulness. Results were compared and analysed. **Results:** At baseline, EEG reveals alpha wave predominance in 18 subjects (75%), theta predominance in 3 subjects (12.50%), and 3 subjects (12.50%) had no predominance in either wave. This illustrates that during EEG recording, 13 subjects (54.17%) were 'alert' and the rest (45.83%) displayed a combination of 'alertness and drowsiness'. After prolonged wakefulness, all subjects (100%) displayed theta predominance, which indicated a 'drowsy' state. At baseline, no significant difference was found in Stroop score between subjects who were 'alert' and those who displayed a combination of 'alertness and drowsiness' on EEG, with mean scores 53.10 (SD=104.20) and 81.10 (SD=79.50) respectively, p=0.473. No significant decline was found in Stroop performance at baseline and after prolonged wakefulness, with mean scores of 65.92 (SD=92.78) and 79.33 (SD=82.27) respectively, p=0.530. **Conclusion:** Present findings show that despite drowsiness on EEG after 18 to 24 hours of wakefulness, cognitive flexibility and attention remain intact.