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The Effects of Sleep Deprivation on Vigilance, Fatigue, and Performance during Simulated Train Driving

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Abstract : Drowsiness is one of the main factors that contribute to the occurrence of accidents, particularly in the transportation sector. While the effects of sleep deprivation on cognitive functions have been reported, the exact relationships remain a critical issue. This study aimed at quantifying the effects of extreme sleep deprivation on vigilance, fatigue, and performance during simulated train driving. A total of 12 participants were asked to drive a train simulator continuously for 4 hours, either in a sleep deprived condition (2-hr of sleep) or normal (8-hr of sleep) condition. Dependent variables obtained during the task included Psychomotor Vigilance Task (PVT) parameters, degree of fatigue (assessed via Visual Analogue Scale/VAS) and sleepiness (reported using Karolinska Sleepiness Scale/KSS), and driving performance (the number of speed limit violations). Findings from this study demonstrated substantial decrements in vigilance in the sleep-deprived condition. This condition also resulted in 75% increase in speed violation and a two-fold increase in the degree of fatigue and sleepiness. Extreme sleep deprivation was clearly associated with substantially poorer response. The exact effects, however, were dependent upon the types of responses.

Keywords : cognitive function, psychomotor vigilance task, sleep deprivation, train simulator
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