

## Examining fatigue and inattention in night shift workers during a two-hour post-shift commute

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Fatigue remains an important traffic safety concern as it can result in insufficient attention to activities critical for safe driving (driver restricted attention; Regan et al., 2011). Night shift workers are at increased risk of drowsiness-related crashes on the drive home from work as the combination of chronic circadian misalignment and high homeostatic sleep pressure results in difficulty to maintain wakefulness and alertness. The current study examined the impact of night shift work on driver state and performance in an instrumented vehicle on a closed test track. Sixteen night shift workers (18-65 years) presented for two 2-hour driving sessions: one following a night of rest (Post-Sleep), and another following a night of shift work (Post-Shift). The driving sessions were divided into 15 minute intervals to further explore effects of fatigue within a session. Objective physiological measurements of drowsiness were monitored continuously throughout the driving sessions, including eye movements and scanning, eyelid movements and blink patterns, polysomnographic recordings of brain activity and ocular muscle movements, and several measures of driving performance and vehicle control.

Compared to the Post-Sleep condition, drivers in the Post-Shift showed as much as double the rate of Theta intrusions in brain and slow eye movements (reflecting that drivers were in the state of micro-sleep). This restricted attention to driving led to greater degradation in lane keeping performance as well as more frequent occurrence of critical driving events (where the in-vehicle experimenter had to activate a secondary brake pedal to prevent a road departure). The Post-Shift condition also resulted in more frequent and longer blinks, less frequent and short fixations, but longer saccades than the Post-Sleep condition. These results confirm that the morning commute following night work carries significant safety concerns. Further, we describe and discuss the implications for fatigue countermeasures.