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Effect of working four night shifts on driving performance and risk behaviour in traffic of anaesthesiology residents

A cross-over study

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Editor,

Residents training to become medical specialists work night shifts on a regular basis. The accompanying sleep–wake pattern has detrimental effects on cognitive functions and task performance.[1,2] These effects extend beyond the performance of clinical tasks and also influence daily activities after working hours, such as traffic participation.

A recent study of Huffmyer *et al.*[1] has shown evidence of decreased driving performance after working six consecutive night shifts. In the University Medical Center Groningen, the Netherlands, however, anaesthesiology residents work no more than four consecutive, 10-h night shifts. This roster is compliant with the 2003 European Working Time Directive[3] which aims to protect employees against the detrimental effects of extended and irregular working hours. Our residents nevertheless frequently express feeling less alert and unsafe to drive home after these four night shifts. These reports, coupled with Huffmyer's results prompted us to investigate whether our four night shift roster also decreases cognitive function and driving performance.

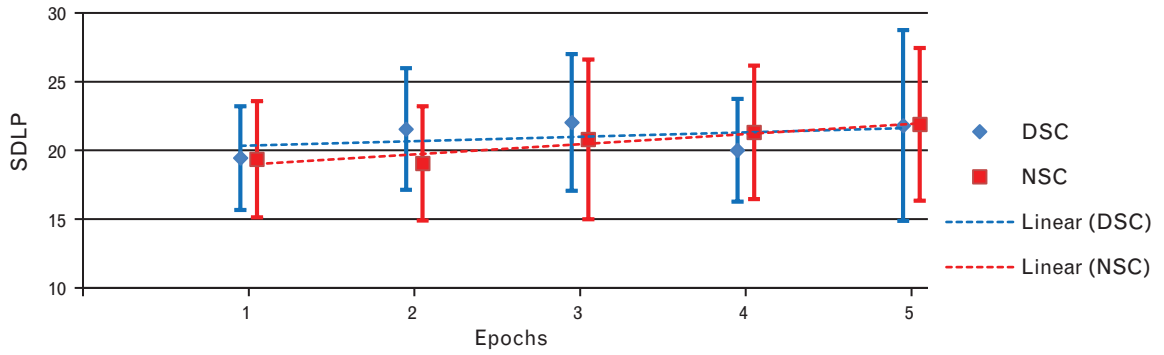
We investigated whether driving a motor vehicle after four consecutive night shifts was less safe compared with driving after a normal week without night shifts. The study was approved by the Institutional review Board (METc- 2017/261, Prof W.A. Kamps, 6 June 2017). Twenty residents participated in a cross-over study of two sessions with identical tests. One session was scheduled before their normal day shift (day shift condition, DSC), the other session after four consecutive night shifts (night shift condition, NSC). The sessions consisted of three tests: first, a validated test of perceptual speed (the Adaptiver Tachistoskopischer Verkehrsauffassungstest)[4]; second, a 25-min monotonous test drive investigating vigilance by measuring swerving from the midline of the road [the SD from the lateral position (SDLP)]; and third, a risk behaviour test measuring the driving speed (mean ± SD in km h^{-1}) after participants had been given an incentive to increase their speed. All driving tests were taken in a driving simulator used normally to assess medical fitness to drive. Participants were asked to fill in a questionnaire measuring subjective sleepiness and alertness using a visual analogue scale-scale, both before and after the tests to minimise bias. We analysed the results using repeated measures Analysis of Variances. In total, 17 residents completed all study procedures, mean age ± SD of participants was 31 ± 3,4; six of the participants were male.

Participants reported higher alertness before (7.25 ± 0.96) and after the DSC-session (7.57 ± 1.0) compared with before (4.93 ± 1.4) and after (4.6 ± 1.5) the NSC-session [$F(1, 14) = 75.72$; $P < 0.001$]. Reported sleepiness before (3.4 ± 1.7) and after (3.3 ± 2.1) the DSC-session was lower compared with before (6.1 ± 1.9) and after (6.9 ± 1.7) the NSC-sessions [$F(1, 14) = 16.10$; $P = 0.001$]. Conversely, and surprisingly, there was no difference in perceptual speed between DSC and NSC (55.95 ± 7.51 vs. 55.71 ± 7.01, respectively; $P = 0.91$).

Although vigilance decreased as the test drive progressed (SDLP increased from 19.4 ± 3.7 to 21.8 ± 6.9 for DSC and from 19.3 ± 4.2 to 21.8 ± 5.5 for NSC, with a significant linear trend [$F(1, 16) = 5.91$; $P = 0.027$)] we found no effect of whether participants drove in the DSC or the NSC [$F(1, 16) = 0.07$; $P = 0.98$]. In addition, the slopes of the linear trend lines of SDLP in DSC and NSC did not differ: (0.46 ± 1.27 vs. 0.73 ± 1.04, respectively; $P = 0.35$, Fig. 1). In other words, participants swerved more as the monotonous test drive progressed but this increase was not larger after night shifts. Furthermore, mean driving speed in the risk behaviour drive did not differ between both sessions: (101.31 ± 7.51 vs. 100.32 ± 13.07, respectively; $P = 0.72$).

From these results we conclude that after four consecutive night shifts our residents did not suffer from decreased perceptual speed or vigilance even though they reported being more sleepy and less alert. This

Fig. 1 Standard deviation of Lateral Position (SDLP) and linear trend for Day Shift Condition (DSC) and Night Shift Condition (NSC)



contrasts with our expectations and also with the results of Huffmyer *et al.* where, after working six consecutive night shifts, residents showed deteriorated driving performance. Possibly this difference is due to our conceivably less strenuous four-night shift roster.

We realise that our group size is relatively small. The results of this study, however, may serve to prompt further studies to provide conclusive information to help create safer rosters as they suggest that it may be possible to build rosters without consequences for cognitive functioning. In addition, although we focused on perceptual speed and vigilance while driving a car, both these cognitive functions are important in clinical anaesthesiological duties as well. Perceptual speed refers to the ability to acquire useful information at a glance and decreased vigilance during monotonous tasks is otherwise known as 'highway hypnosis'. Perceptual speed is used in high stress anaesthesia situations and decreased vigilance may play a role during long uneventful procedures and could be an area of further research (hopefully disproving often informally raised suspicions about anaesthesiologists' workload).

The current study suggests that it may be possible to construct safe night shift rosters with negligible impact on cognitive functions. This is important because not working during the nights is not an option for healthcare personnel and neither is working with decreased cognitive capacities. Patients rely on doctors to be on the top of their game during every working hour and doctors rely on themselves after these working hours to get home safely. Hospitals have a responsibility to protect doctors and patients from the detrimental effects of night shifts. It seems that we may have found a solution for this problem in our department.

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Anaesthesia and orphan diseases

Bohring–Opitz syndrome

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Editor,

We write to describe the anaesthetic management of a patient with Bohring–Opitz syndrome (BOS), a rare sporadic genetic disorder characterised by various anomalies including among others a typical facial appearance, developmental delay and a typical posture, who has presented to our institution several times for both