SLEEP INERTIA IN SUSTAINED OPERATIONS

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Introduction

- Sleep inertia refers to a brief period of grogginess and impaired cognitive performance typically experienced upon waking.
- Sleep inertia is of concern to anyone required to perform safety-critical tasks soon after waking.
- This study examined sleep inertia in split and rotating shiftwork schedules.

Methods

- Sixteen healthy, adult subjects (ages 21-33; 8 females)
- 9-day laboratory study including two baseline nights (BL1, BL2; 10h time-in-bed (TIB)), followed by four 24h periods of either a:
  - 6h on / 6h off split sleep schedule (5h TIB in off period, 10h TIB per 24h; Shift Days 1-4); or
  - 8h on / 8h off rotating sleep schedule (6h40min TIB in off period, 10h TIB per 24h; Shift Days 1-4)

  and two recovery nights (10h TIB).
- Wake up periods investigated here started at 0800h (TIB end).
- 8min sleep inertia test bouts included the Samn-Perelli (SP) Fatigue Scale, Karolinska Sleepiness Scale (KSS) and a 3-minute Psychomotor Vigilance Task (PVT-B) at 2, 17, 32 and 47min post-TIB.
- A linear mixed effects model (fully saturated) was used to assess the effect of schedules (6h and 8h), days (BL2, Shift Day 2, Shift Day 4) and time (2, 17, 32, 47min) on SP fatigue scores, KSS scores, PVT-B lapses (number per test; reaction times >355ms) and PVT-B mean fastest 10% reaction times (F10RT).

Results

- There was a significant effect of time for all variables (all $p<0.001$) with subjective ratings of fatigue and sleepiness decreasing, and objective performance improving from 2min to 47min post-TIB.
- There was a significant effect of day for SP Fatigue and KSS (both $p<0.001$) with subjects reporting higher fatigue and sleepiness across the shiftwork days.
- There was a significant schedule*day interaction ($p<0.001$) for mean F10RT, which revealed that in the 8h schedule mean F10RT was similar on BL and Shift Day 2, but significantly worse on Shift Day 4. In the 6h condition, however, mean F10RT was significantly worse on Shift Day 2 versus BL and Shift Day 4.
- There was no main effect of day or interaction effects for lapses.

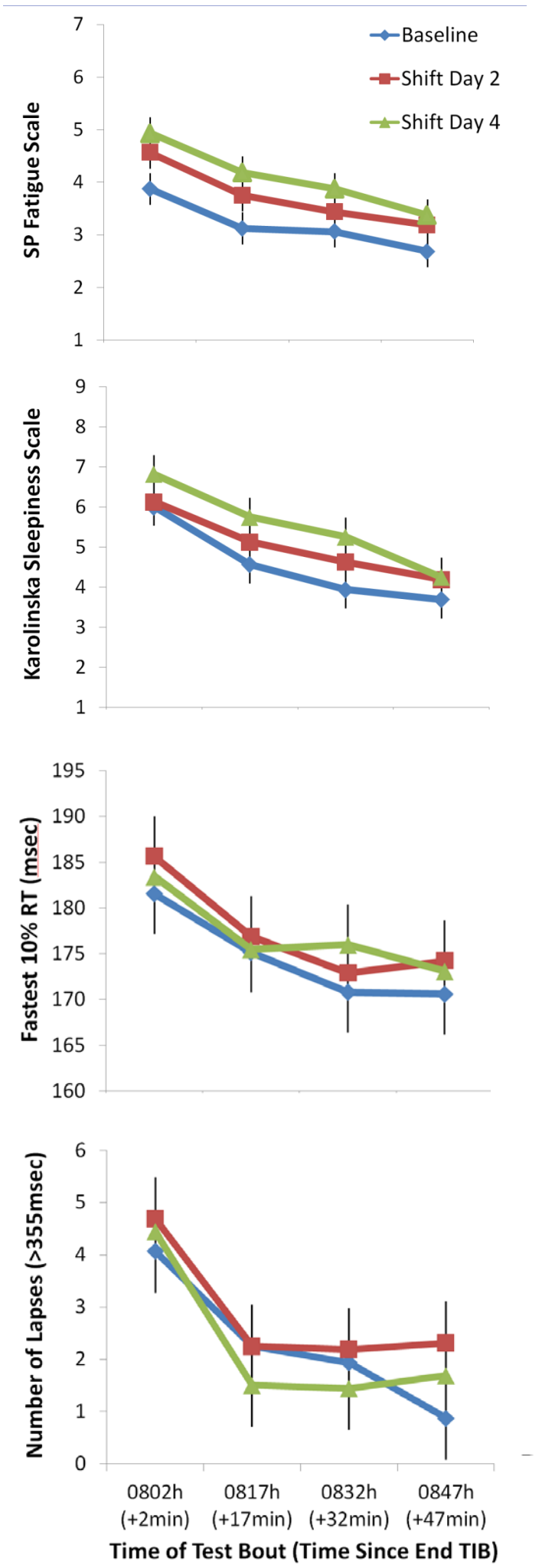

Figure 1. A. Samn-Perelli Fatigue Scale; **B.** Karolinska Sleepiness Scale; **C.** PVT-B Mean Fastest 10% Reaction Times; **D.** PVT-B Number of Lapses (>355ms). Data are presented as means (± SEM) across the four test bouts performed at 2, 17, 32, and 47mins post-end TIB (end TIB at 0800h). Data for the 6h and 8h schedules are shown combined as there was no significant main effect of schedule for all variables.

Discussion

- Sleep inertia effects were evident after a 10h total TIB opportunity per 24h, regardless of immediate prior TIB opportunity (i.e. 10h on BL, 5h in the 6h schedule, and 6h40min in the 8h schedule).
- These results suggest that subjective sleep inertia effects worsened across both schedules, although this finding was not reflected by objective measures.
- Further analyses will investigate the relationship between sleep inertia and physiological parameters such as sleep (total sleep time, slow wave activity etc.) and the cortisol awakening response. Investigations will also be carried out into the extent to which sleep inertia occurs after split and rotating sleep opportunities at other times of day.

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