

Subjective and objective sleepiness in a simulated 4 hours on/8 hours off maritime watch system

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Introduction

- Seafarer fatigue – with ships being operated on a 24/7 basis – poses a risk to traffic safety at sea and has already contributed to many accidents
- This study investigates subjective and objective sleepiness in a simulated 4 on /8 off watch system during 1 week
- In addition, the effects of a disturbed free watch on sleepiness during the subsequent watch was investigated

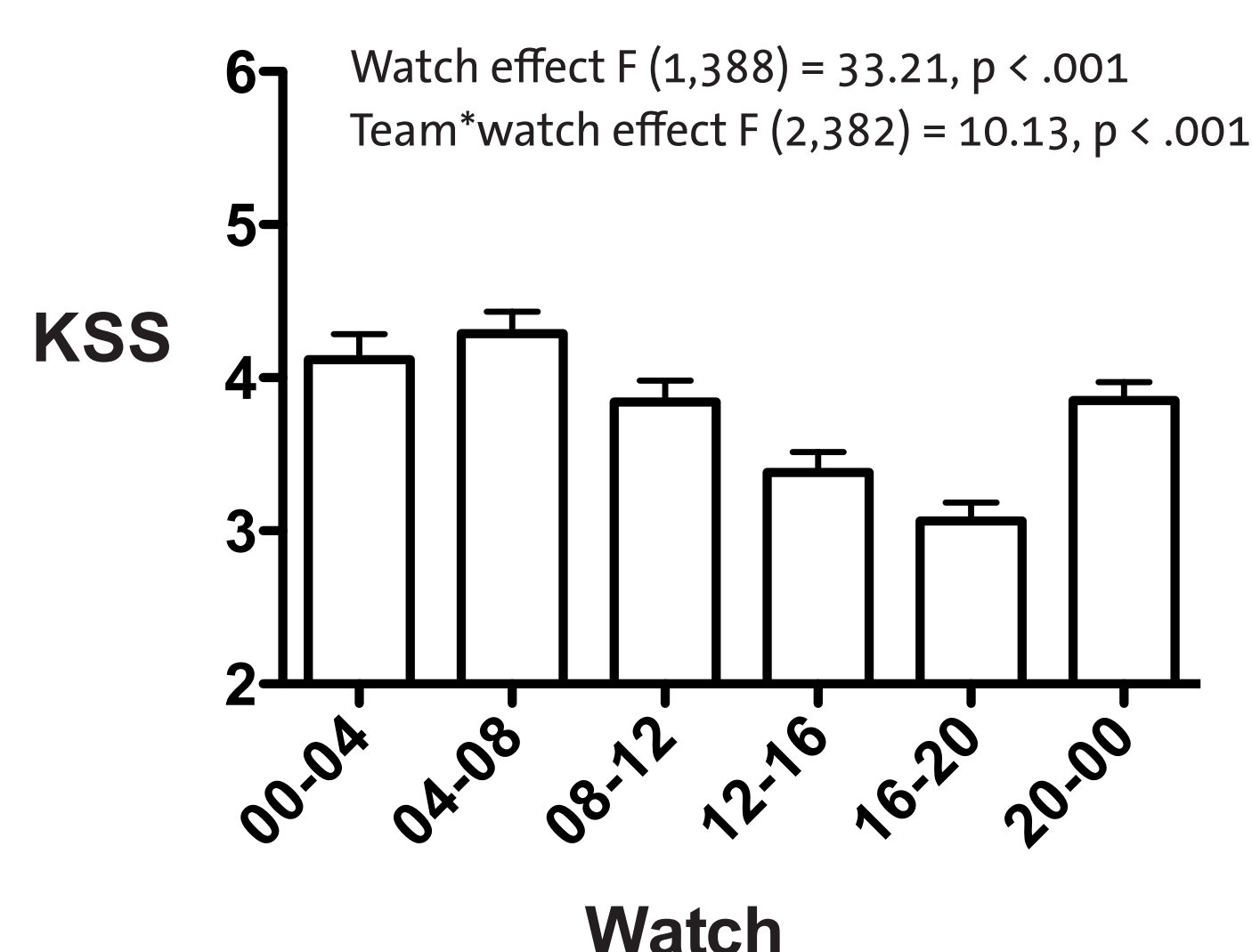
Conclusion

- Sleepiness peaks consistently during the 04:00 to 08:00 watch
- Alertness peaks during the 12:00 to 16:00 watch (PVT) or during the 16:00 to 20:00 watch (KSS)
- One free watch disturbed with low demanding paper work increases sleepiness in all watch teams during the subsequent watch

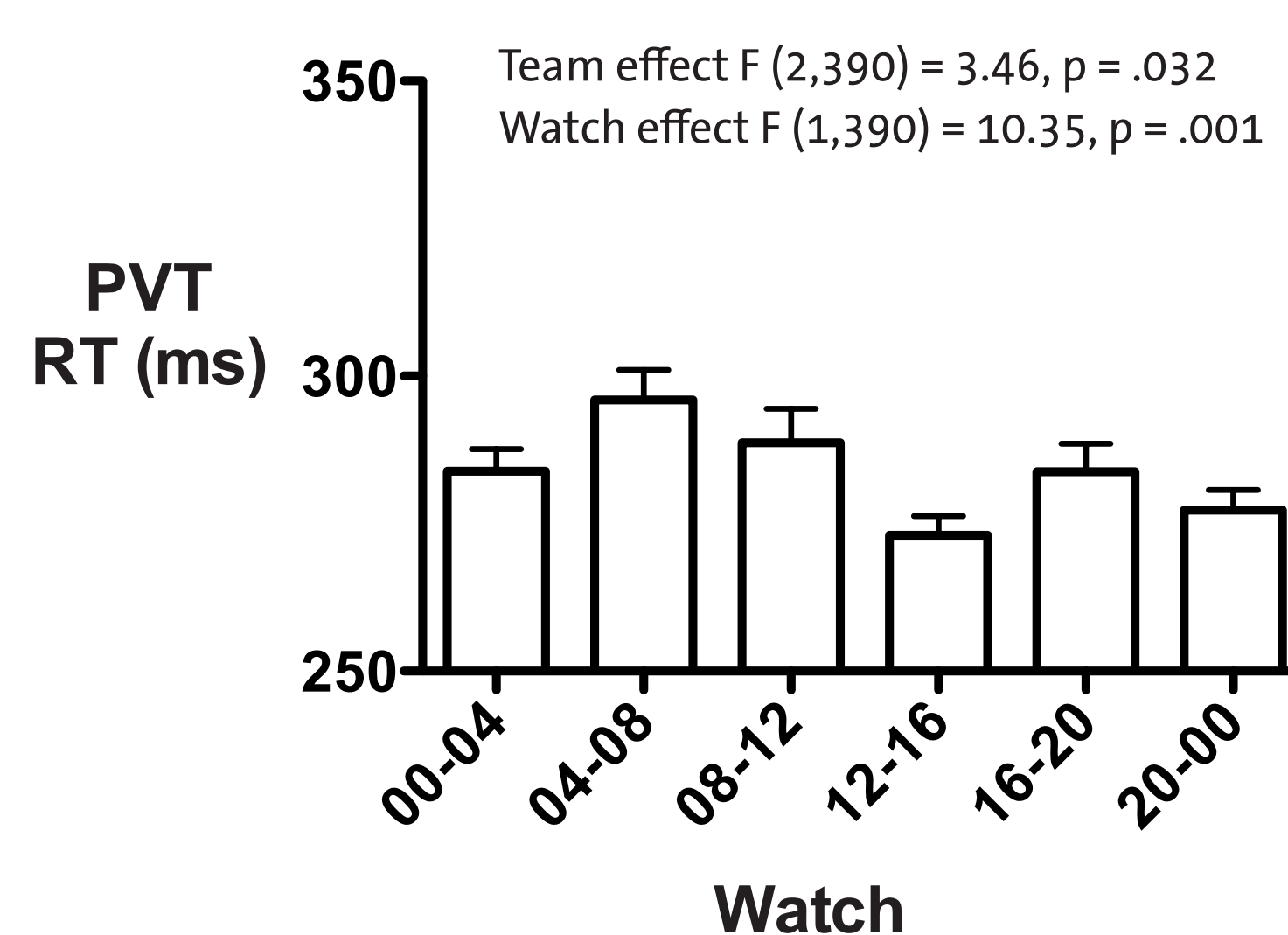
Results

Sleepiness peaks during the 04:00 to 08:00 watch...

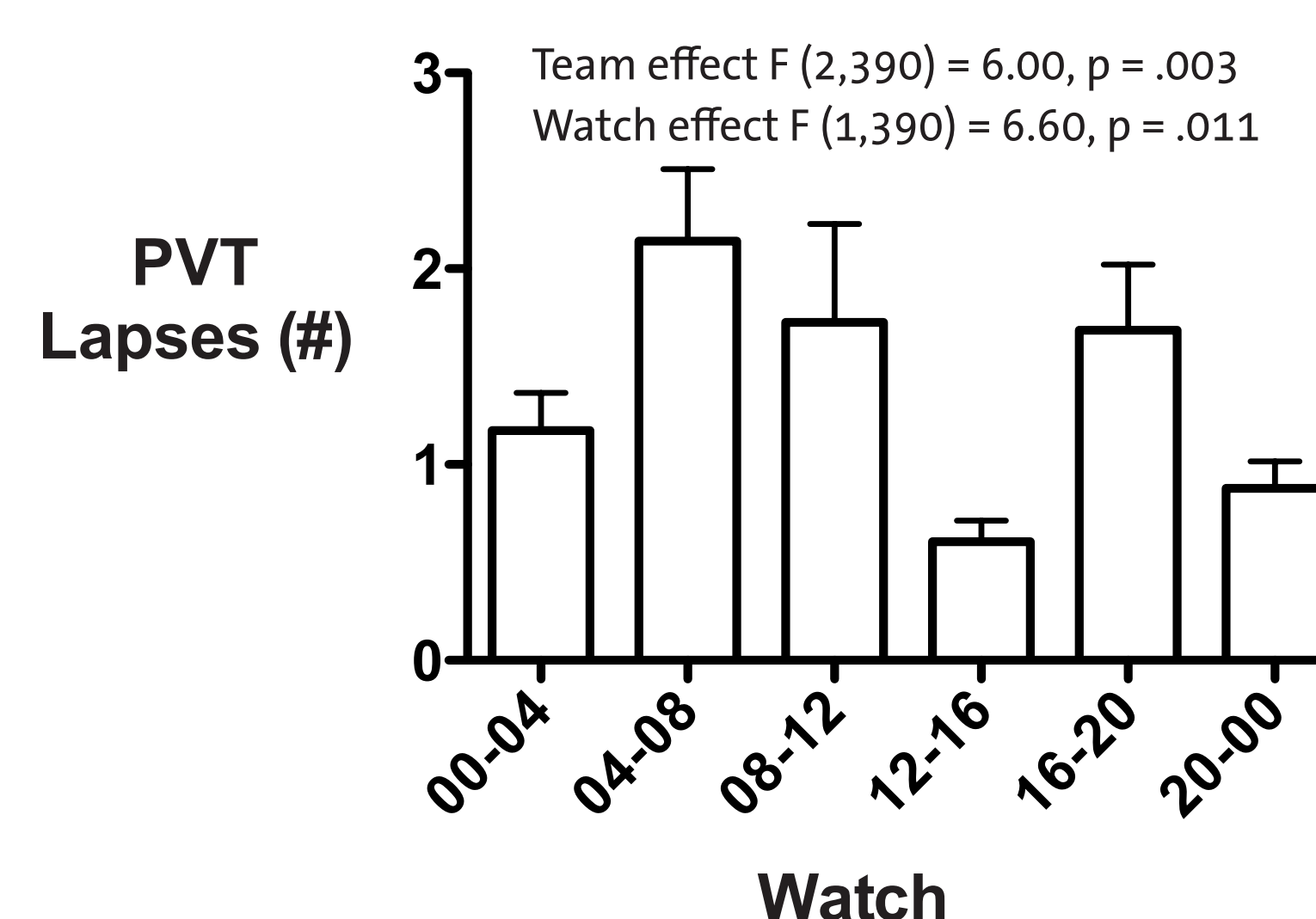
in terms of Karolinska Sleepiness Scale (KSS),



Psychomotor Vigilance Test (PVT) reaction time,

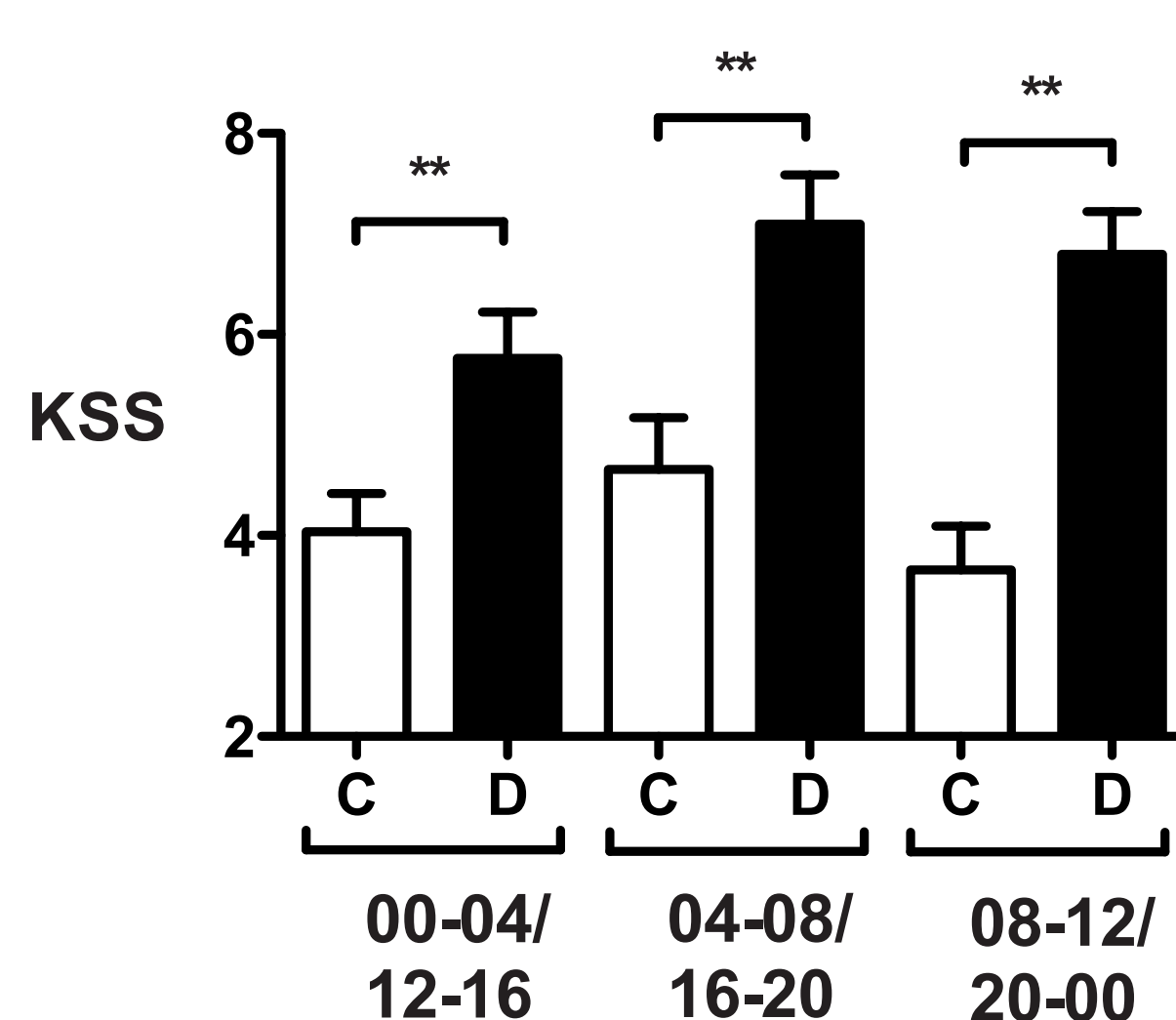


and PVT lapses.

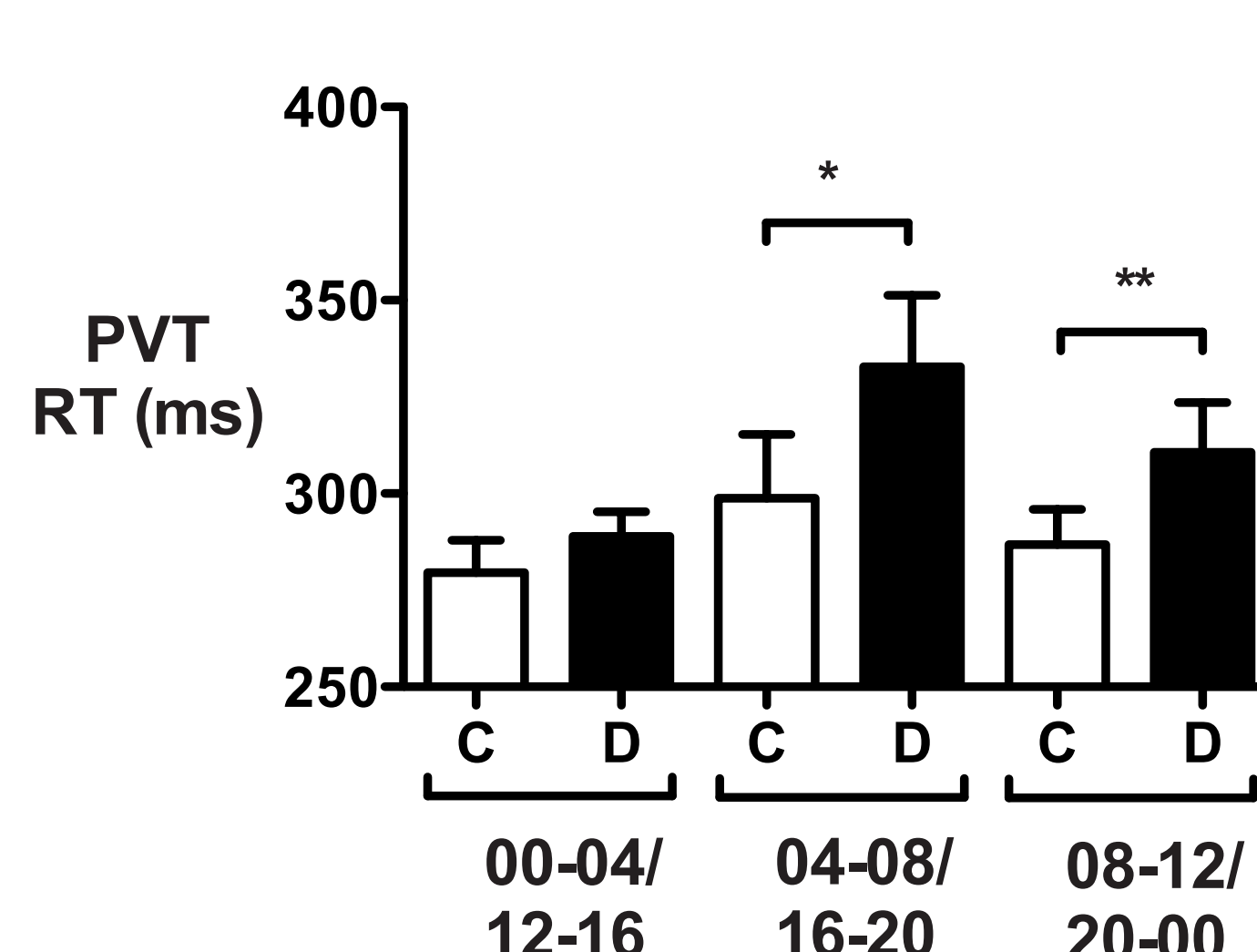


Disturbance, by paper work, of a single free watch increases sleepiness in all watch teams during the following watch...

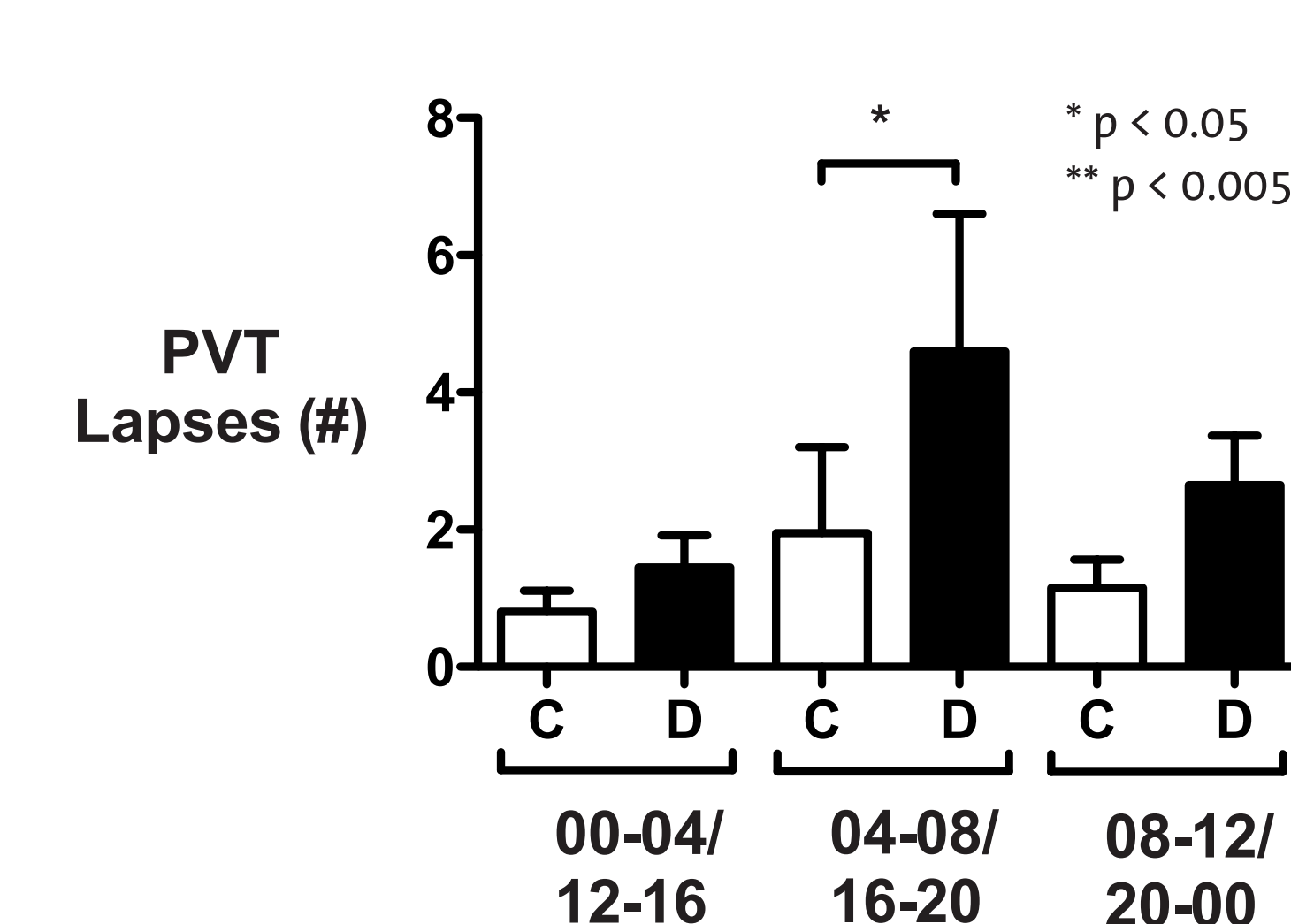
in terms of Karolinska Sleepiness Scale (KSS),



Psychomotor Vigilance Test (PVT) reaction time,

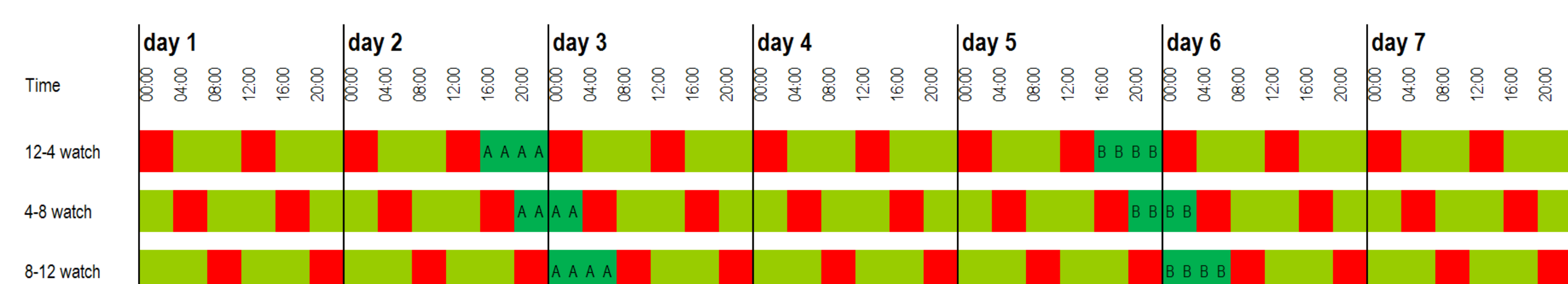


and PVT lapses.



Work diary questions indicate that symptoms of fatigue peak during the night watches (indicated in red)

Question	Scale	00-04	04-08	08-12	12-16	16-20	20-00
Heavy eyelids	1 (not at all) to 5 (great extent)	1.83 ± 0.12	1.70 ± 0.10	1.40 ± 0.07	1.41 ± 0.09	1.34 ± 0.07	1.34 ± 0.06
Difficulties focusing	1 (not at all) to 5 (great extent)	1.47 ± 0.09	1.53 ± 0.10	1.24 ± 0.06	1.22 ± 0.06	1.28 ± 0.07	1.19 ± 0.05
Irresistible sleepiness	1 (not at all) to 5 (great extent)	1.70 ± 0.12	1.42 ± 0.09	1.22 ± 0.06	1.35 ± 0.09	1.16 ± 0.06	1.19 ± 0.05
Tired eyes	1 (not at all) to 5 (great extent)	2.03 ± 0.09	2.15 ± 0.10	1.44 ± 0.07	1.73 ± 0.09	1.68 ± 0.10	1.63 ± 0.08
Difficulties holding eyes open	1 (not at all) to 5 (great extent)	1.52 ± 0.10	1.52 ± 0.10	1.29 ± 0.07	1.25 ± 0.08	1.17 ± 0.06	1.18 ± 0.05
Impaired performance	1 (not at all) to 5 (great extent)	1.39 ± 0.08	1.41 ± 0.08	1.20 ± 0.06	1.16 ± 0.05	1.26 ± 0.07	1.21 ± 0.05
Effort to stay awake	1 (not at all) to 5 (great extent)	1.37 ± 0.09	1.34 ± 0.09	1.14 ± 0.05	1.17 ± 0.07	1.15 ± 0.07	1.16 ± 0.04
Nodding off	1 (not at all) to 5 (all the time)	1.23 ± 0.07	1.23 ± 0.06	1.18 ± 0.06	1.21 ± 0.06	1.09 ± 0.03	1.13 ± 0.05



Method

30 bridge officers (aged 30 ± 6 years; 29 men) with on average 7 years experience at sea participated in five parallel bridge simulators during two separate experimental weeks. The three watch teams started with a full training day in the simulators and then, from day 1 on, started an identical voyage in the North Sea and the English Channel. The free watch disturbance was counterbalanced and took place between day 2 and 3 or day 5 and 6 (see Figure; red = work, green = time off). Participants rated their sleepiness every hour (Karolinska Sleepiness Scale, KSS) and carried out a 5-minute psychomotor vigilance test (PVT) at the start and the end of every watch. In addition, a work diary was filled in at the end of every watch.

To determine differences between watches, mean values were calculated for every watch - excluding the watch following the disturbed free watch - and compared with two factor (watch & watch team) ANOVA.

To determine the effect of a free watch disturbance, the watch following the disturbed free watch (either A or B in the figure) was compared with the similar control watch in the other half of the week with paired t-test.

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