



The influence of split shifts on sleep and fatigue

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Background

A representative study of Swedish shift workers showed that 19% had split shifts, i.e. two shorter shifts of 4-5 hours, with a long break (usually 2-5 hours) between the working periods. Split shifts are often associated with early morning work and long workdays and were also regarded as one of the biggest problems for the shift workers in the representative study. There are hardly any studies of split shifts and the aim with this paper was to examine whether split shifts are related to disturbed sleep, stress and increased fatigue.

Method

The study group was bus drivers in local transport. 231 drivers (26% females, age range: 24-67 years) filled in a questionnaire and 60 drivers (18 females, age range: 24-64 years) participated in a two-week diary study, which also included actigraphy. 23 of the drivers in the diary study worked at least one split shift during the two-week data collection.

Results

An analysis of retrospective (6 months before the questionnaire was distributed) objective working hour data showed that 74% of the drivers had split shifts, and among those drivers 35% of the workdays involved a split shift. The questionnaire study showed that 36% of the drivers that had split shifts thought that it was a big problem. The group that reported big problems with split shifts showed more sleep/wake complaints, such as insomnia (46% versus 18% for those that worked split shifts but did not regard it as a problem, $p < 0.001$) and involuntarily falling asleep at work (29% versus 12% for the non-problem group, $p < 0.01$).

The results for the actigraphy data are presented in figure 1. The results showed that split shifts were associated with early wake-up times (mean: 05:16) and short sleep duration (05h 52 minutes), although early morning shifts (start time < 06.00h) showed the shortest sleep duration. The mean length of the split shifts were 12h (SD=1:13h), including a break of 4h and 12 min (SD=1:08h).

The split shifts often involved early morning work. In order to isolate the effect of having two work periods during the same day the split shifts were compared with a control shift that had similar (± 30 minutes) start time. In total 18 drivers were included in the within-subject comparison and the results are presented in table 1.

The results showed no significant differences between the split shift and the matched com-

parison shift, except for napping which was more common during the split shift. It should be pointed out that napping during split shifts occurred during the long break that took place between the two work periods.

Nine drivers in the diary study reported that split shifts were a big problem for them. A comparison with 14 drivers, who did not perceive split shifts as a big problem, showed that the problem group took less naps during the break (28% versus 67%) and reported higher levels of fatigue and sleepiness during the split shifts.

Conclusions

Split shifts were common, regarded as one of the drivers' biggest working hour problems, were longer than the other shifts and started early in the morning, and were associated with short sleep. The results did not support that split shifts are associated with poor sleep quality, elevated stress and high levels of fatigue. On the contrary, split shifts were associated with more napping than the other shifts. Napping during the long break seems to be a key factor for the tolerance of split shifts, and the drivers who perceived split shifts as a big problem reported less napping.

Figure 1

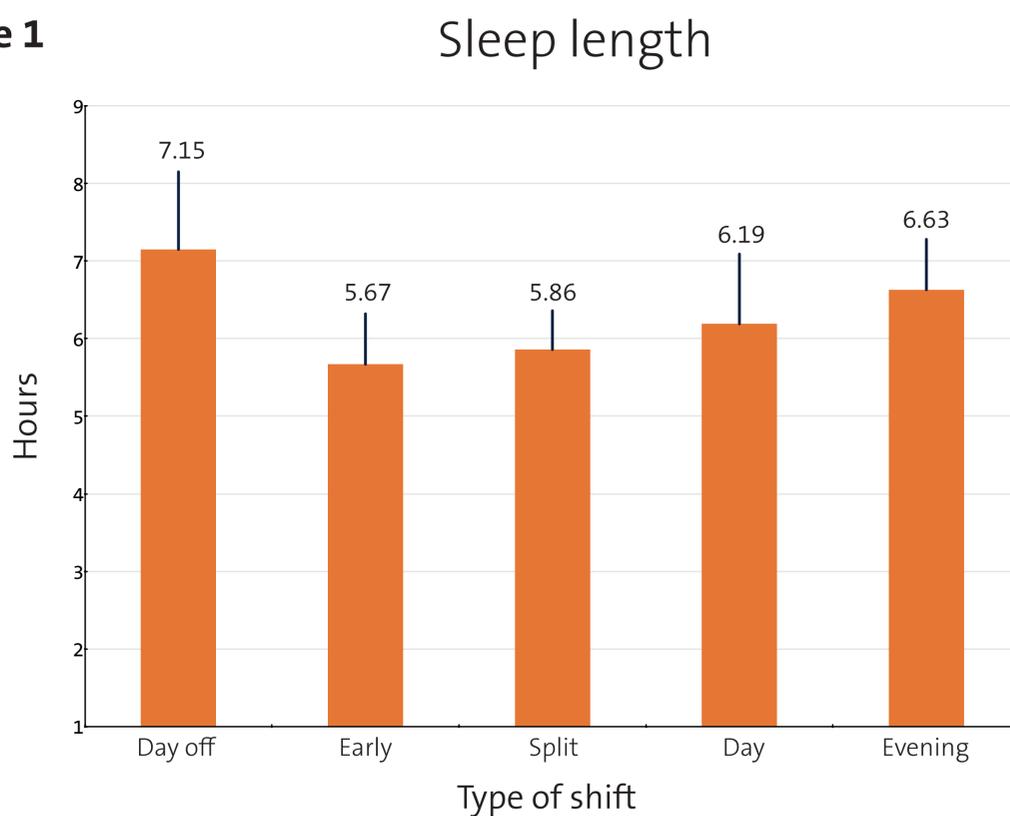


Table 1

Means and standard deviation (SD) for sleep, fatigue and stress variables.

	Split shift		Control shift		P-value
	Mean	SD	Mean	SD	
Shift start time (clocktime)	06:23	00:44	06:26	01:03	n.s.
Sleep length (clocktime)	06:12	01:03	06:20	00:55	n.s.
Sleep efficiency (%)	90.2	5.6	90.2	5.0	n.s.
Stress at bedtime (1 not at all – 5 very high)	2.0	1.2	1.7	1.0	n.s.
Worry (at bedtime) for next day (1-5 very high)	1.9	1.3	1.9	1.3	n.s.
Difficulties falling asleep (1 not at all – 5 very high)	2.2	1.3	2.1	1.4	n.s.
Sleep quality (1 very high – 5 very low)	2.6	1.0	2.9	1.1	n.s. (p=0.06)
Tired (1 low – 5 high)	2.6	1.2	2.6	1.2	n.s.
Stress (1 low – 5 high)	2.0	1.1	1.7	1.0	n.s.
KSS (1 alert – 9 sleepy)	5.5	1.8	5.9	1.8	n.s.
Napping (%)	50		17		0.03
Napping length (minutes)	69.4	31.5	30.0	20.0	-

The analysis is based on within-subject t-test and chi2. KSS=Peak Karolinska Sleepiness Scale rating during the work period.