



Bus drivers' working hours and their effects on sleep and fatigue

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Objective

Bus drivers have very irregular work hours characterized by long shifts, early morning and evening shifts, and split shifts. The aim of this poster is to summarize a study of how bus drivers' working hours affects their sleep and fatigue.

Methods

The study included 231 drivers in local transport who filled in a questionnaire (response rate: 65%) related to working hours, sleep and fatigue. We also analysed their objective working hours for a period of 4.5 months. 60 drivers wore an actigraph and filled in a sleep/wake diary during 13 days including both work days and days off. 18 drivers participated in an experimental field study with an instrumented bus. The experiment simulated a split shift with an early morning start, which was compared with a day off (within Individuals cross-over design). The experiment was carried out in the late afternoon and the driving session was approx 1.5 hours. During driving the participants rated Karolinska Sleepiness Scale (KSS, 1 very alert-9 very sleepy) every 5th minute and EEG and EOG was monitored during the whole drive. Before and after the drive, a 10 minute PVT was performed in the bus.

Results

Questionnaire study and analysis of working hours

- 86% of the drivers had work shifts that were longer than 10 hours.
- Split shifts were normally between 12 and 13 hours, including a long break in the middle of the shift
- 77% of the drivers had early morning shifts that started before 06h.
- The drivers rated "long working hours" (40%), "very irregular starting times" (34%), and "split shifts" (23%) as the biggest problems with the working hours
- The most prevalent sleep/wake problems were "insufficient sleep length" (41% reported problems several times/week), "not being well-rested" (37%) and "feeling sleepy at work" (33%).
- 15% of the drivers were suspected to suffer of sleep apnea (defined as reporting heavy snoring and breathing cessations during sleep)

Diary and actigraph study

- The average total sleep time (based on actigraphy) was 6.39 hours, which was more than 1 hour shorter compared to the drivers self-reported sleep need.
- Figure 1 shows the sleep length for the different shifts. Early morning and split shifts showed a mean sleep length that was shorter than 6 hours.
- The early morning shifts were also associated with high levels of sleepiness at wake-up time and work-related fatigue.

Experimental field study

- Figure 2 shows significantly higher subjective sleepiness (KSS) for the split shift compared with the day off (control condition, $p < 0.001$).
- During the split shift 25% of the KSS ratings were 7 or higher. The corresponding value for the days off was 1%.
- Figure 3 shows significantly longer reaction times (PVT) for the split shift compared with the days off (control condition, $p < 0.05$).
- There was no difference in measures of driving performance between the conditions.
- The EEG and EOG data showed that none of the drivers felt asleep during driving.

Conclusions

The study showed that insufficient sleep, disturbed sleep and work-related fatigue were common among the bus drivers. On average the drivers slept one hour less than their subjective sleep need. The disturbed sleep and the elevated fatigue levels was partly explained by the working hours and in particularearly morning shifts and split shifts had a negative impact on sleep and wakefulness.

The experimental study confirmed that split shifts were associated with increased levels of sleepiness, however driving performance was not affected during the simulated split shift despite the relatively high level of fatigue.

Figure 1. Sleep length

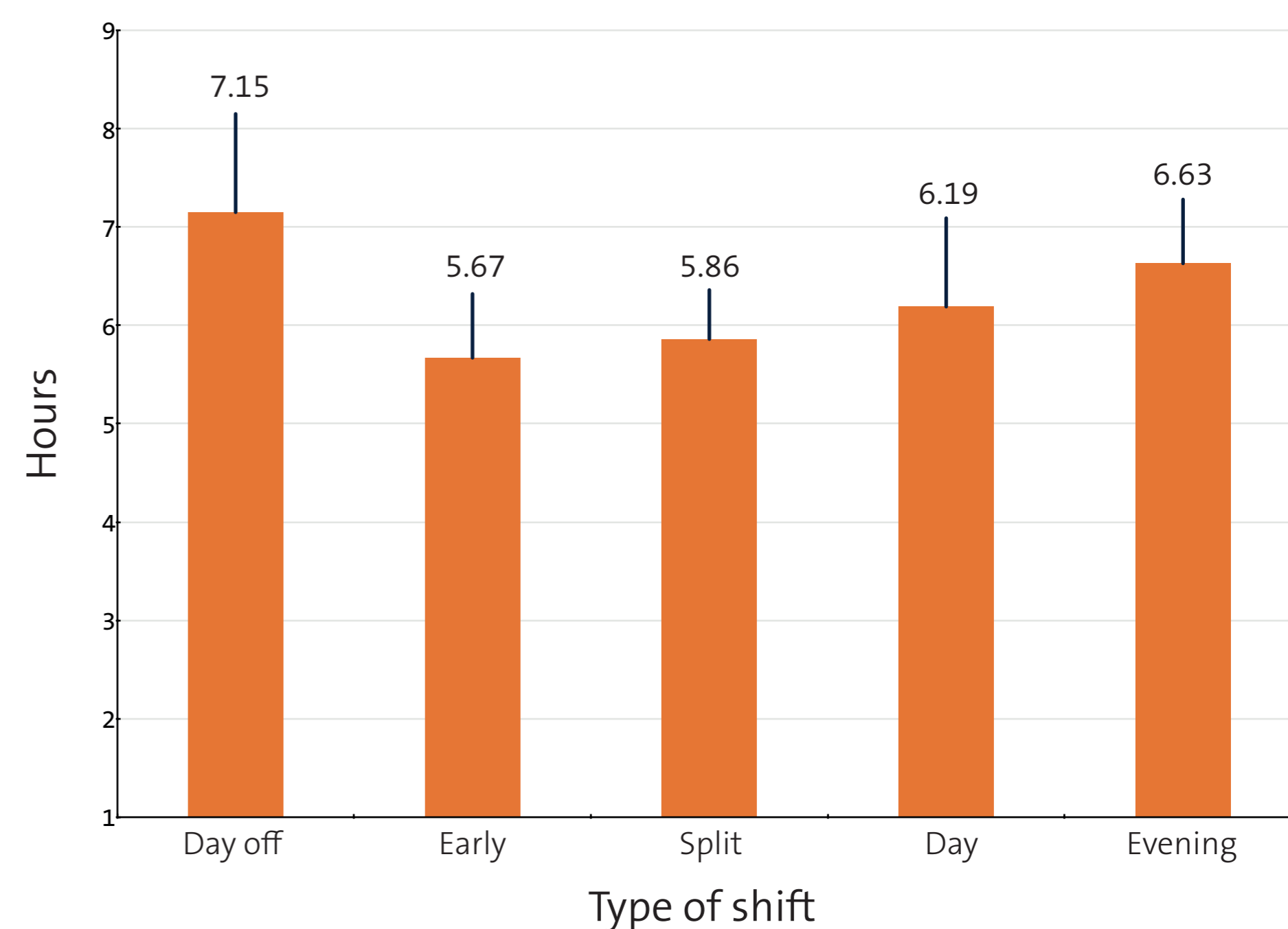


Figure 2. Mean KSS±SEM

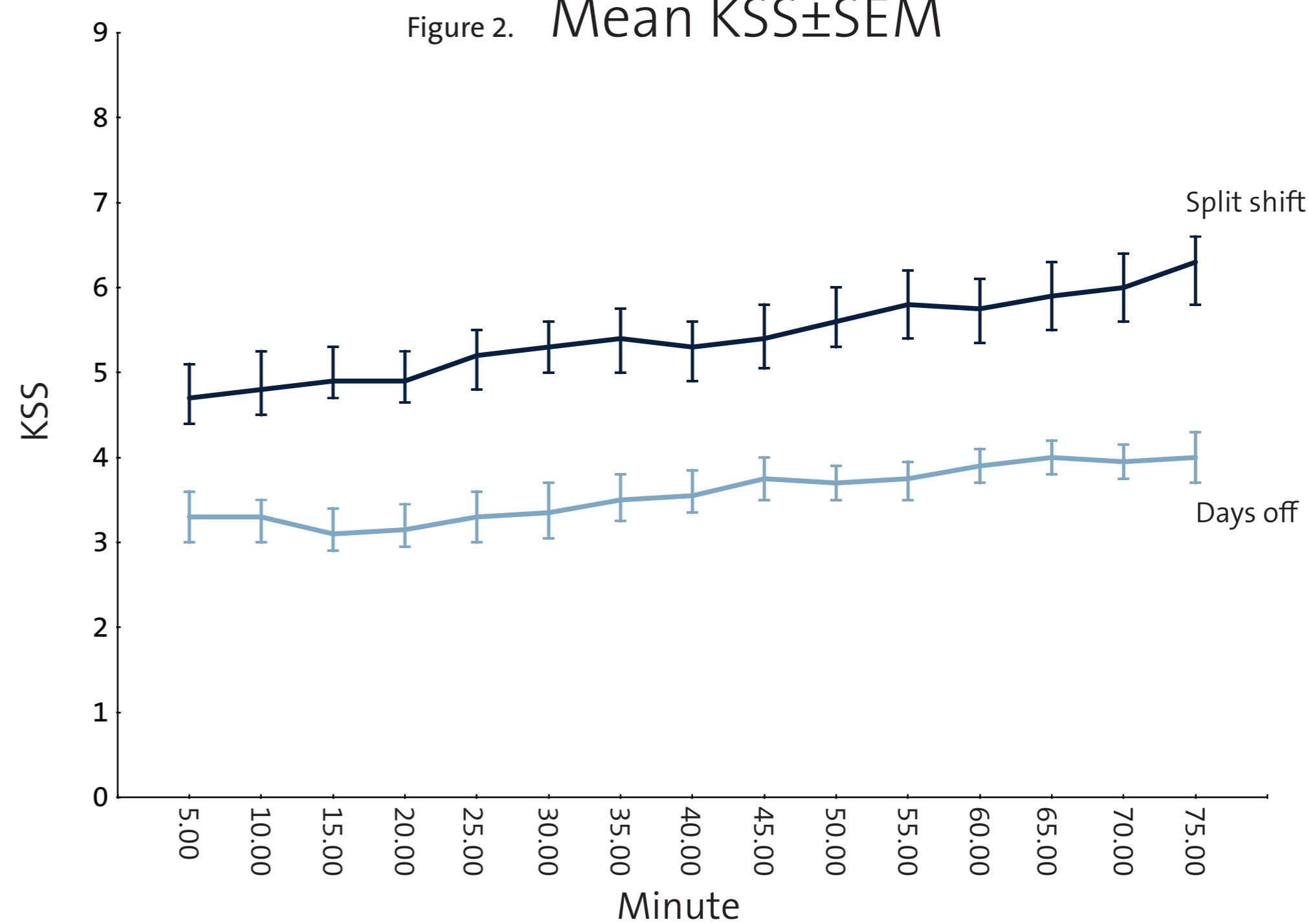
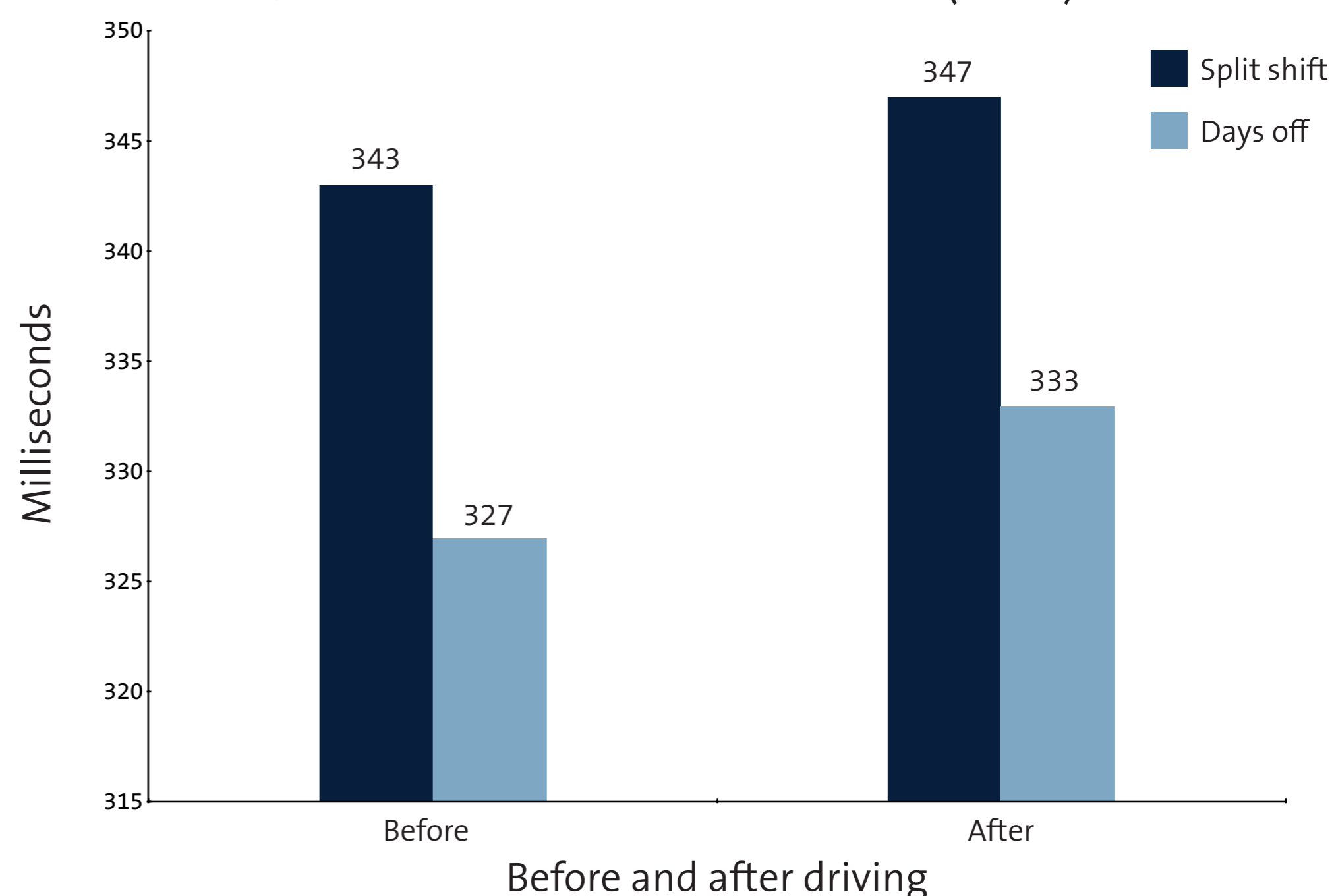


Figure 3. Mean reaction time (PVT)



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