

The Impact of Non-driving related Tasks on Take-over Performance

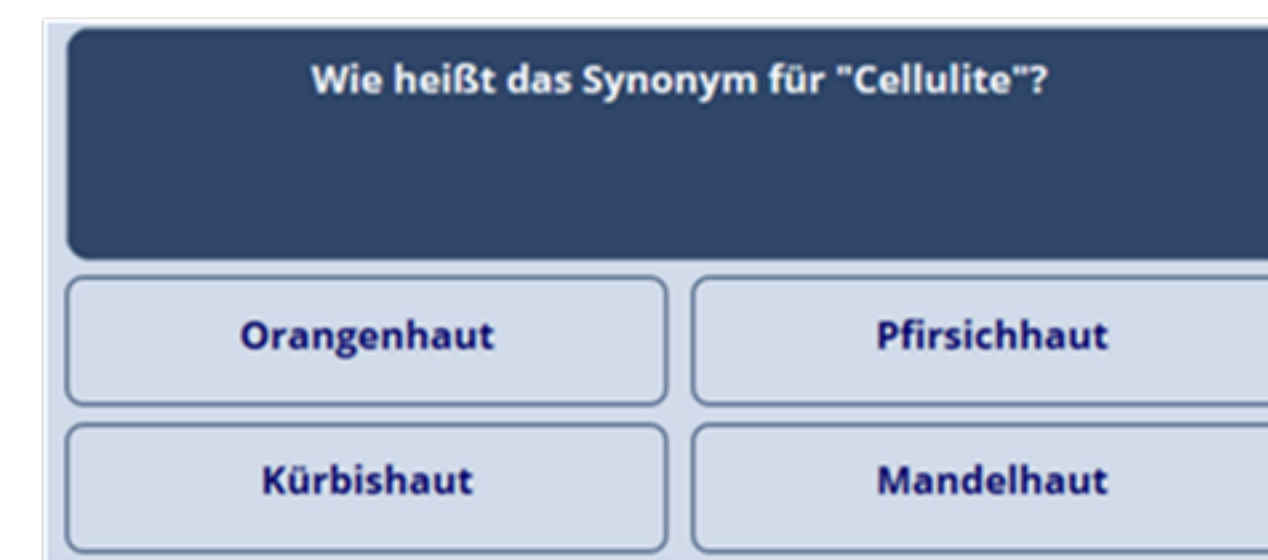
In Conditional Automated Driving (CAD) the driver can for the first time turn away from the driving task and engage in non-driving related tasks (NDRTs). However, if the system detects a situation it can not handle, the driver gets requested to intervene. When such a request-to intervene (Rtl) is issued, the driver has to regain control within the available time budget. In two experiments the impact of standardized NDRTs on drivers' fatigue and take-over performance was examined. The two experiments were identical concerning the simulated environment (track, weather conditions, traffic) as well as the NDRTs. The experiments differed only in the duration of the ride and hence the duration of engaging in the NDRTs.

NON-DRIVING RELATED TASKS

- Monotonous monitoring task
- One of four letters (P-q-p-d) was displayed for 8 – 15 sec on a display
- The target stimulus was the „p“



- Multiple choice Quiz-task
- One question / four answers
- After answering one question the next one was displayed



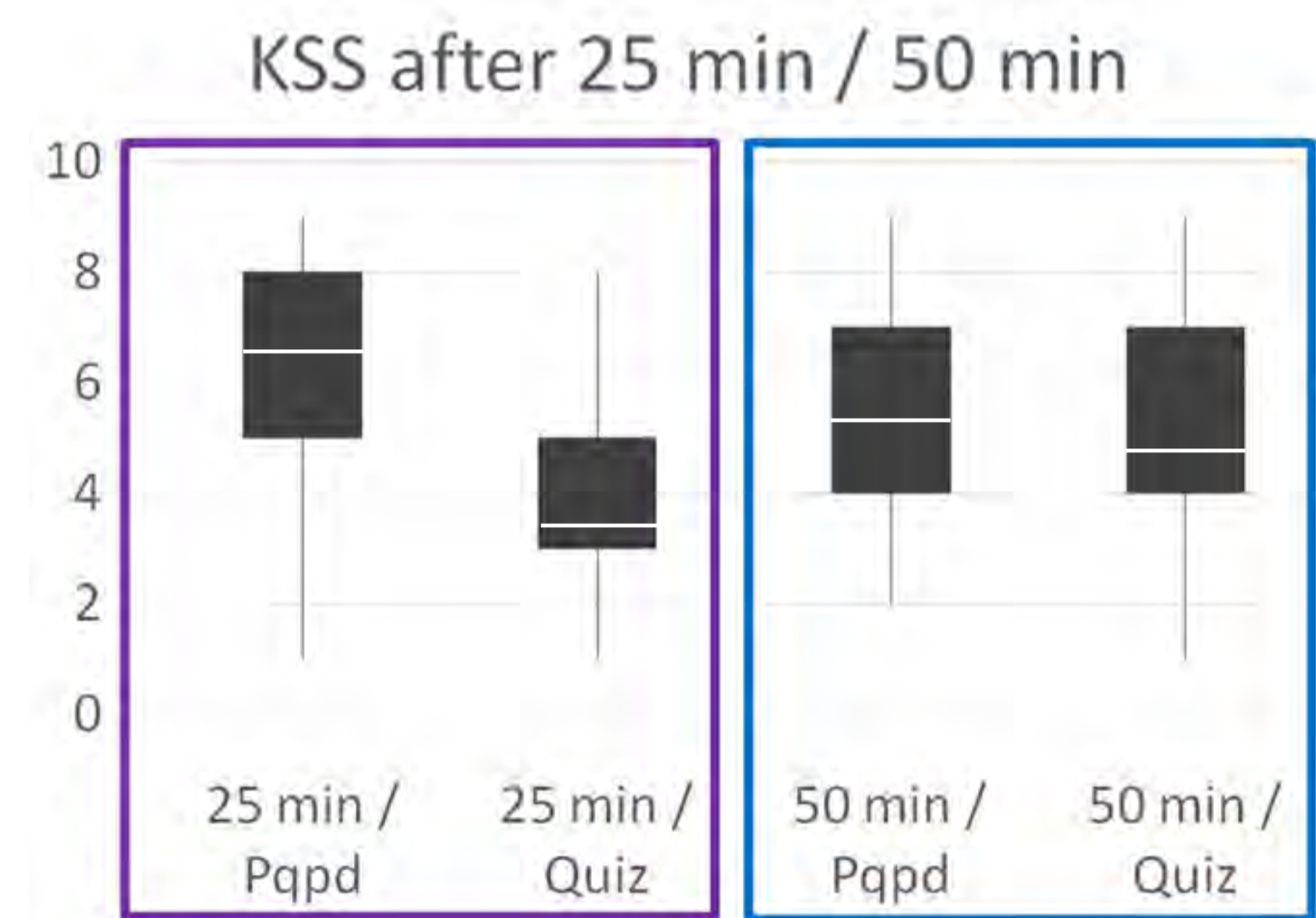
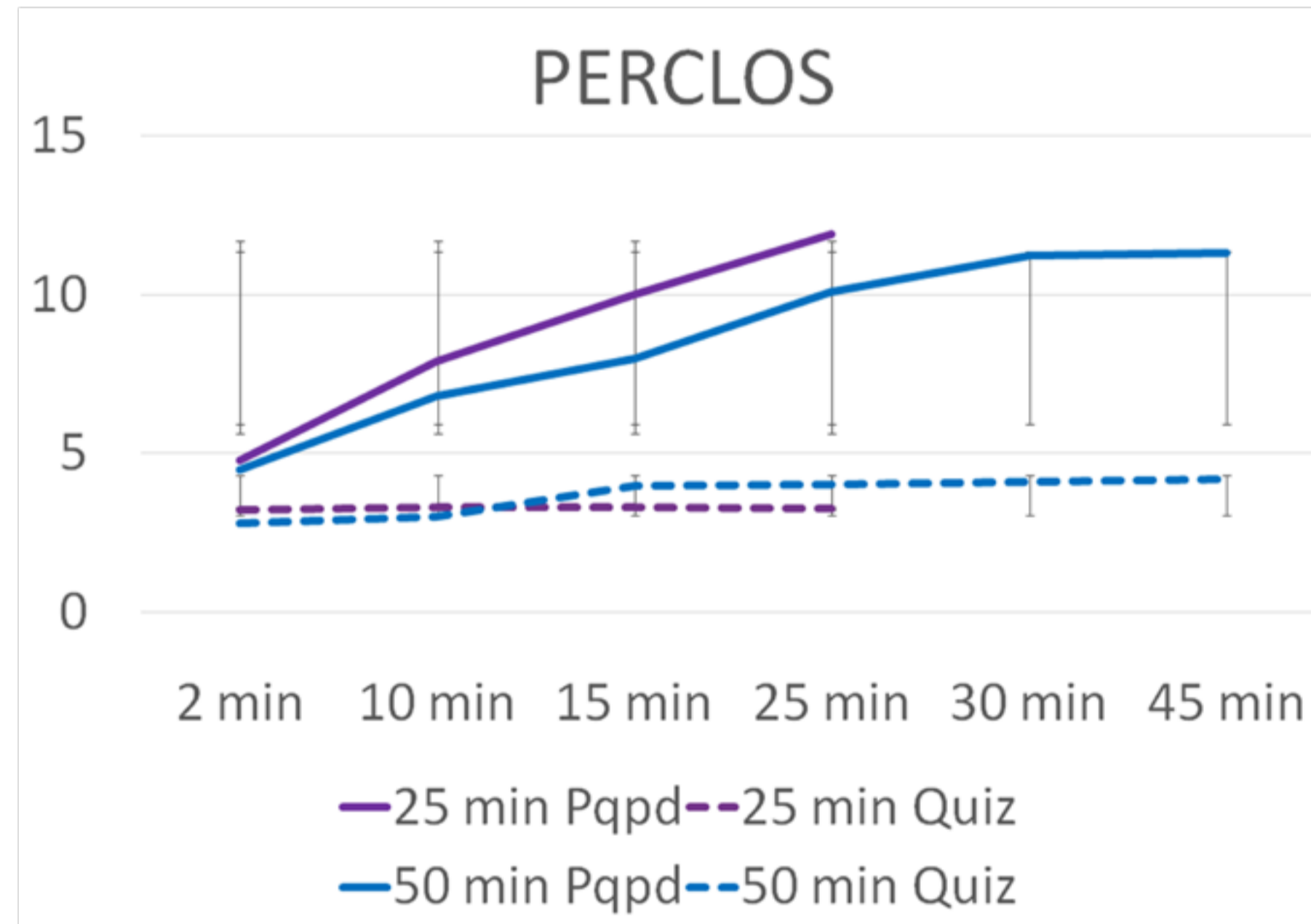
EXPERIMENT 1: WITHIN-SUBJECTS

- Two automated rides
- With both two NDRTs
- After 25 min a critical take-over situation occurred (time-to-collision = 7 sec)

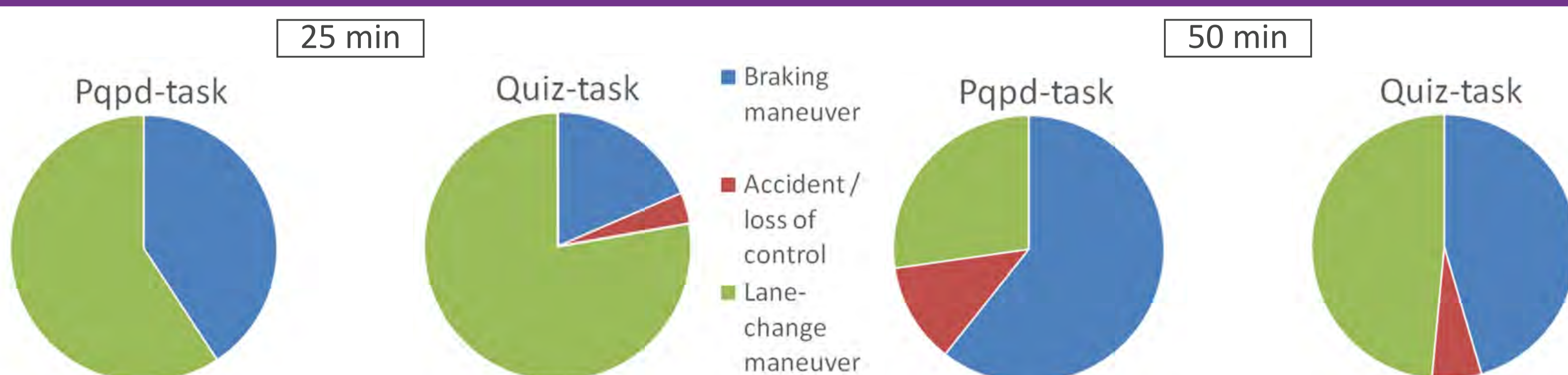
EXPERIMENT 2: BETWEEN-SUBJECTS

- One automated ride
- With the Pqpd- or the Quiz-task
- After 50 min a critical take-over situation occurred (time-to-collision = 7 sec)

RESULTS



TAKE-OVER REACTION



CONCLUSION

- Passive task related fatigue emerges after 25 minutes of automated driving
- The best method to detect fatigue is the objective PERCLOS measure
- A quiz task can counteract emerging subjective fatigue, however after 50 min this effect is rather small
- After prolonged automated driving (50 min) the take-over reaction was impaired