



The
University
Of
Sheffield.



LightCAP
project

Road lighting for driving and walking

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13 April 2022

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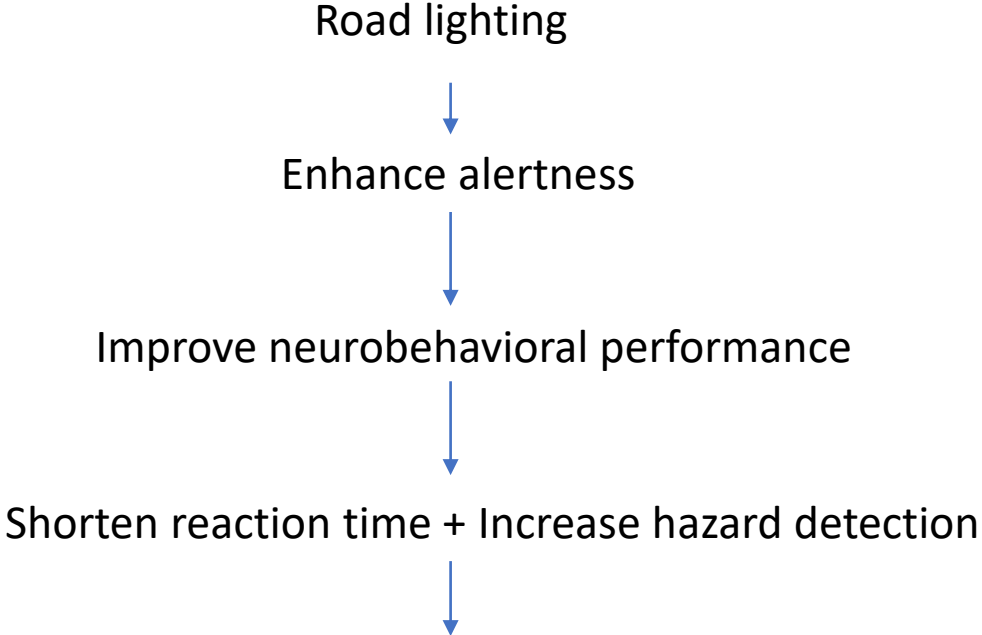
Facts

Road user	Level of injury	Number
All	Killed	1,752
	Seriously injured	25,945
	Slightly injured	125,461
Car Occupants	Killed	736
Pedestrians	Killed	470

It is expected that a decrease in alertness is associated with an increase in the frequency or risk of involvement in a road traffic collision (RTC).



Why the new knowledge about non-visual effects of light could be matter for pedestrian and drivers?



Reduction in the risk of road traffic collisions or pedestrian falls

This support more walking and make the road safer for drivers and pedestrians

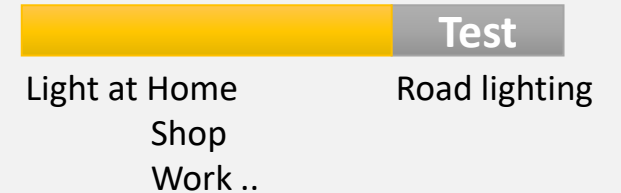


The first experiment was designed to answer four questions

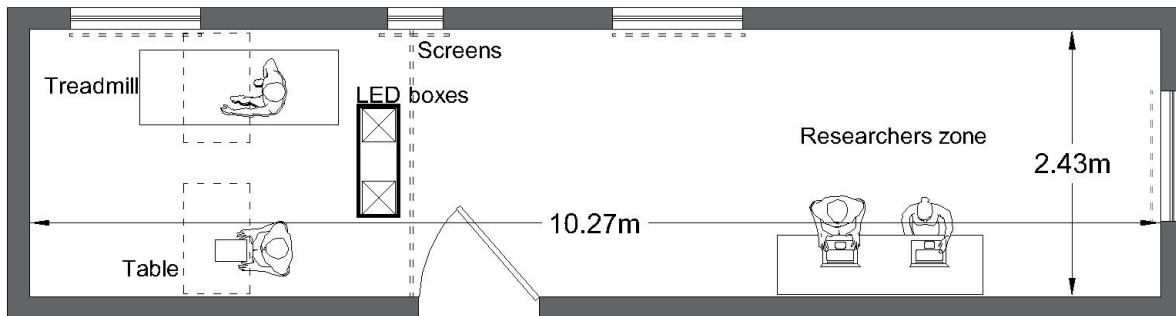
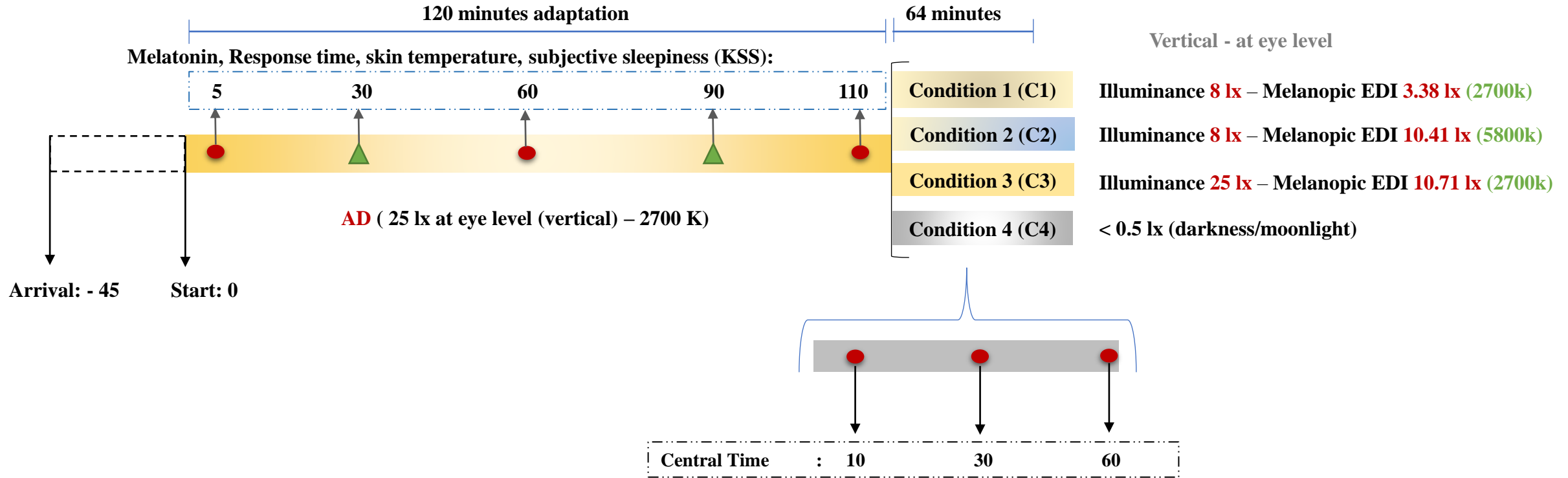
1. When we transit from indoor to outdoor at night, does a pedestrian's and driver's level of alertness vary with period of exposure?
2. Is alertness increased at higher light levels than typical of road lighting?
3. Is alertness increased (at a given light level and a given moment of duration) using lighting of higher short wavelength content?
4. Does physical activity (i.e., walking rather than sitting) affect the relationship between lighting, duration and alertness?

Pedestrian walk and drivers journey

Exposure to



Protocol



Light settings and participants

Exposure period	Condition label	Illuminance*	CCT	Melanopic EDI
Adaptation period	AD	25 lx	2700 K	10.7
Test period	C1	8 lx	2700 K	3.4
	C2	8 lx	5800 K	10.4
	C3	25 lx	2700 K	10.7
	C4	<0.5	2700 k	< 0.5

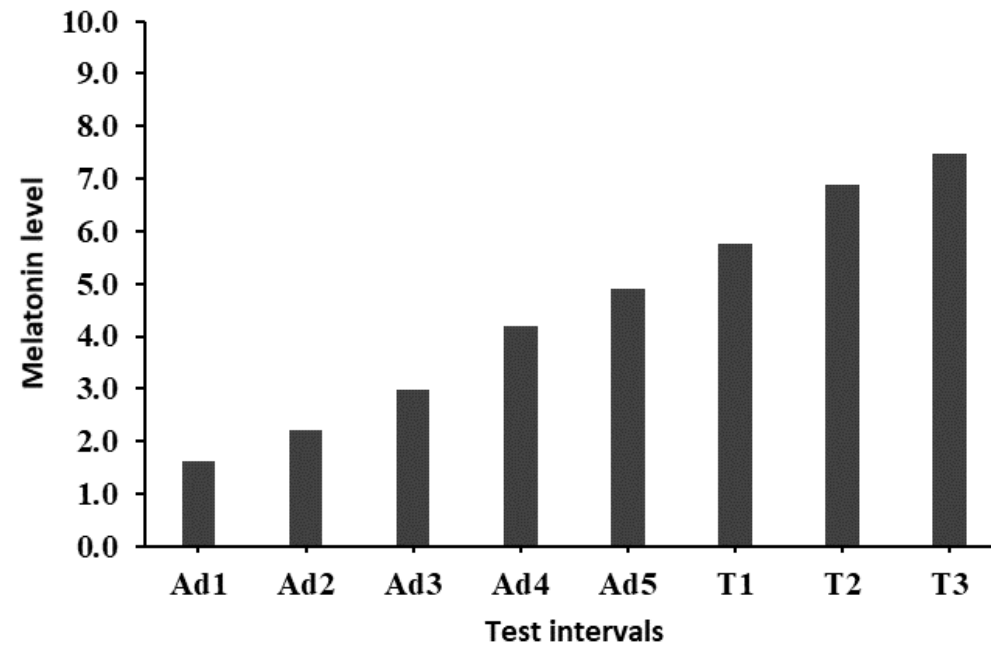
*Vertical illuminances at eye level (1.5 m above the floor)

40 participants were recruited, every ten participants (five males and five females) allocated to one of the test conditions, their mean age is 22.1 years.

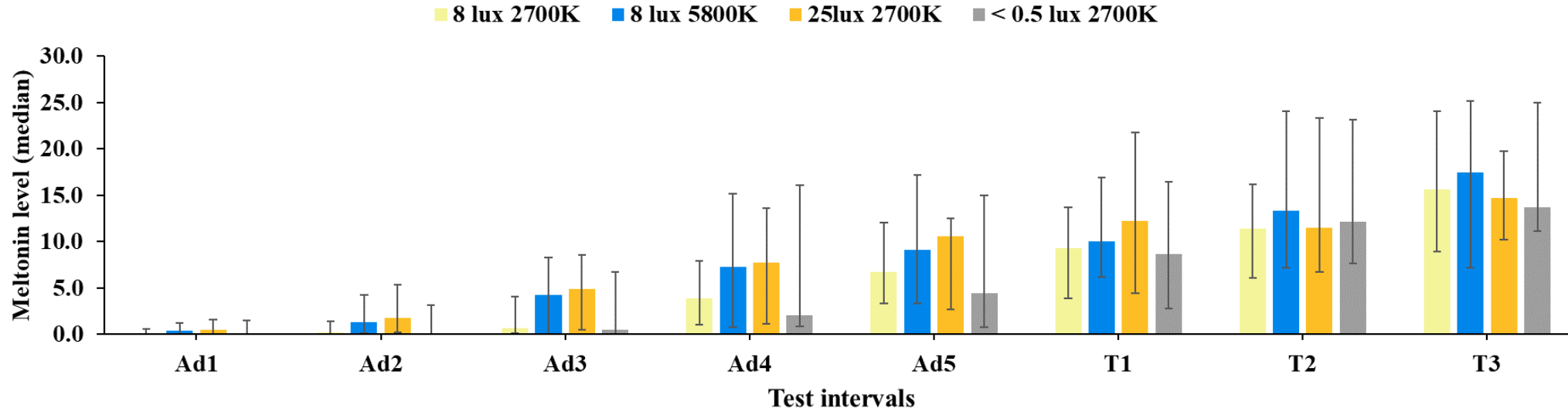
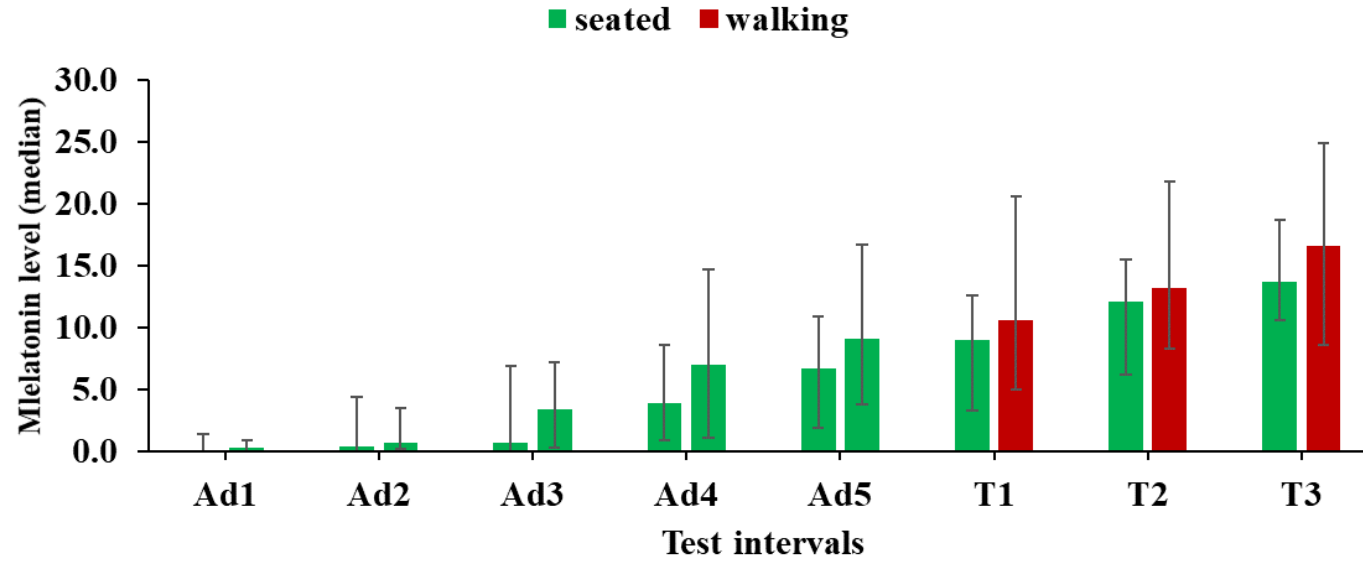
Results

Melatonin levels, Skin temperature, Reaction time, and KSS.

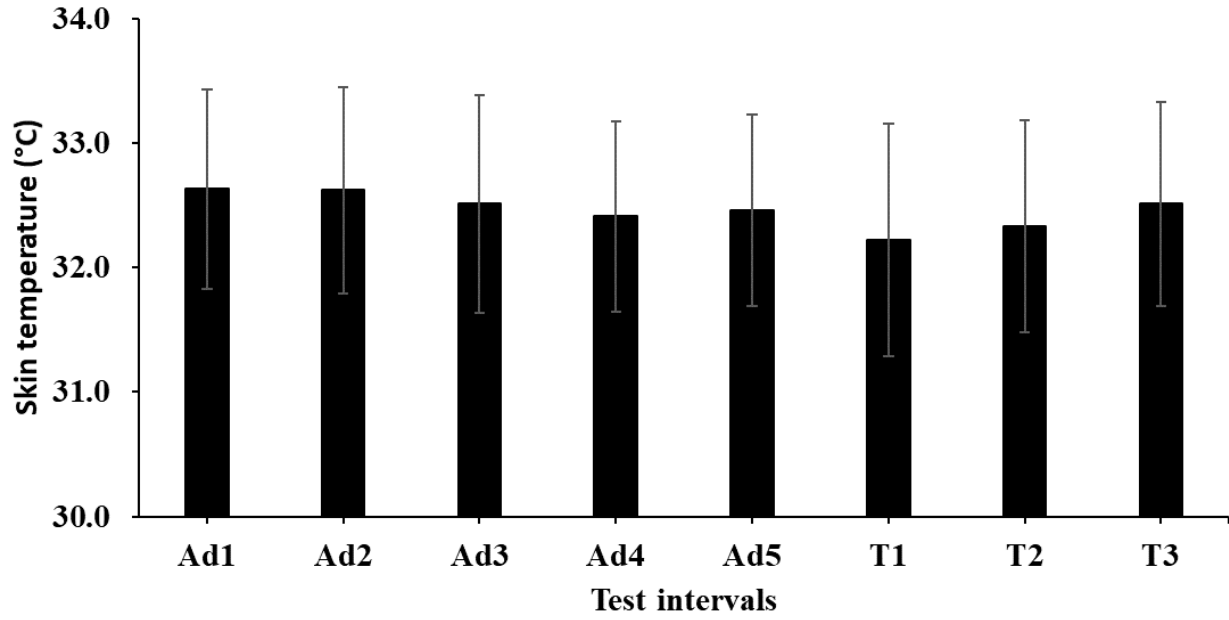
Melatonin levels



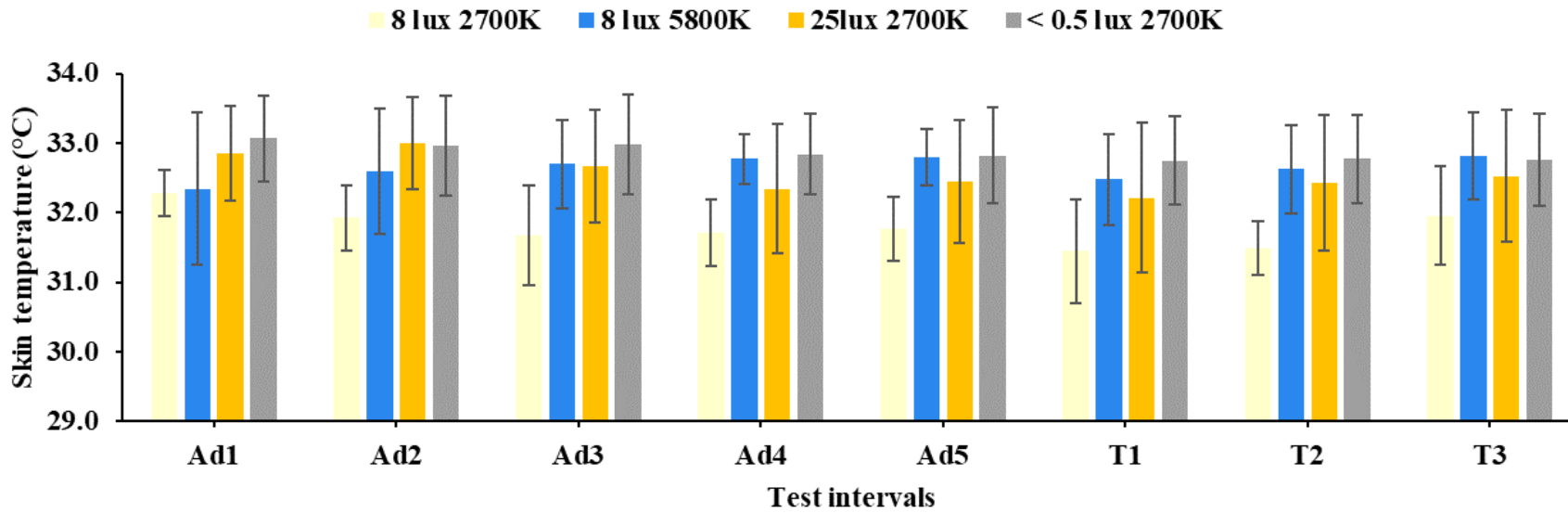
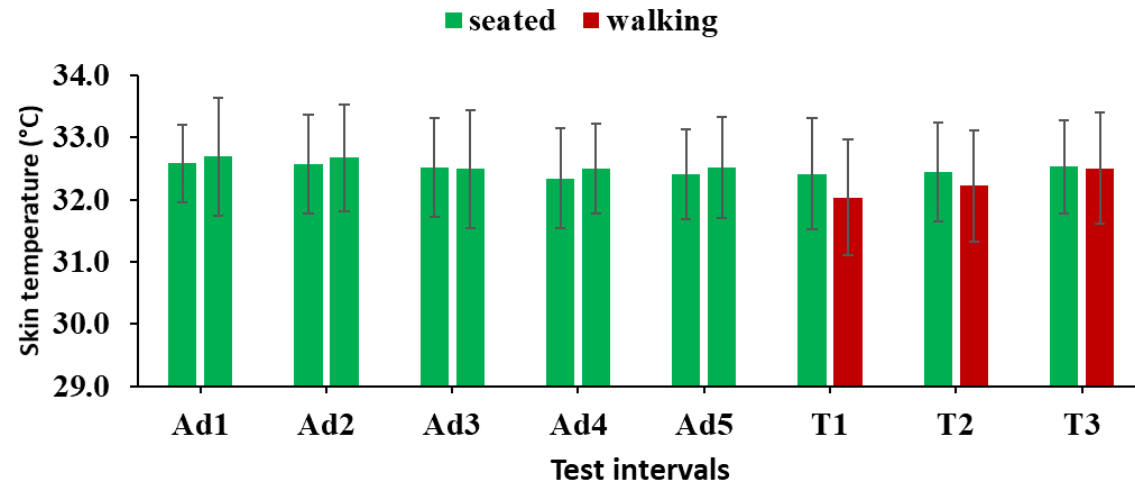
Melatonin levels



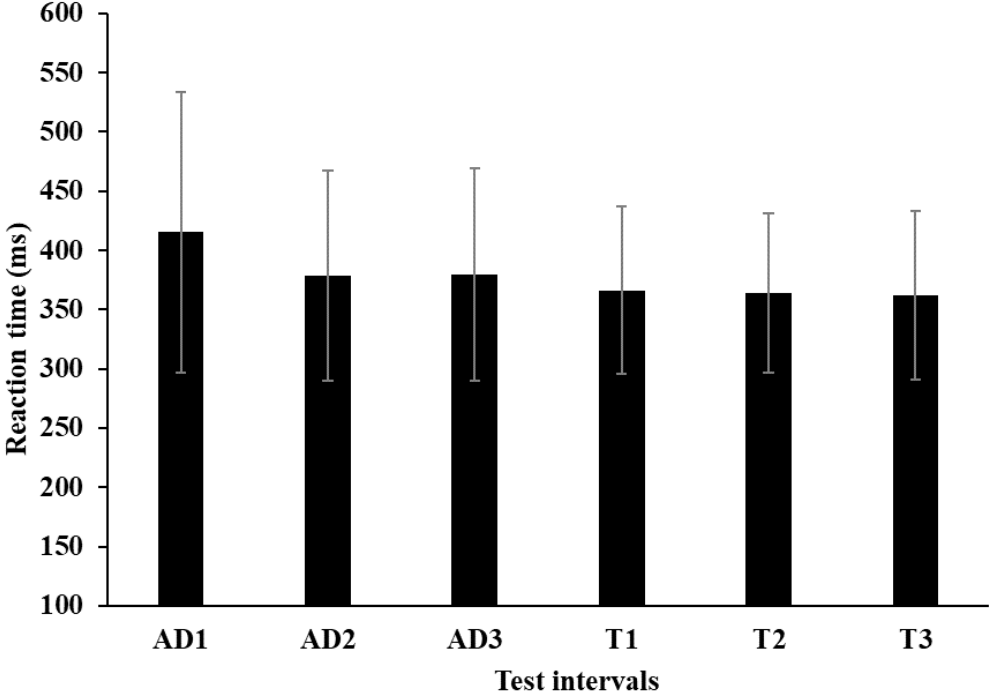
Skin temperature



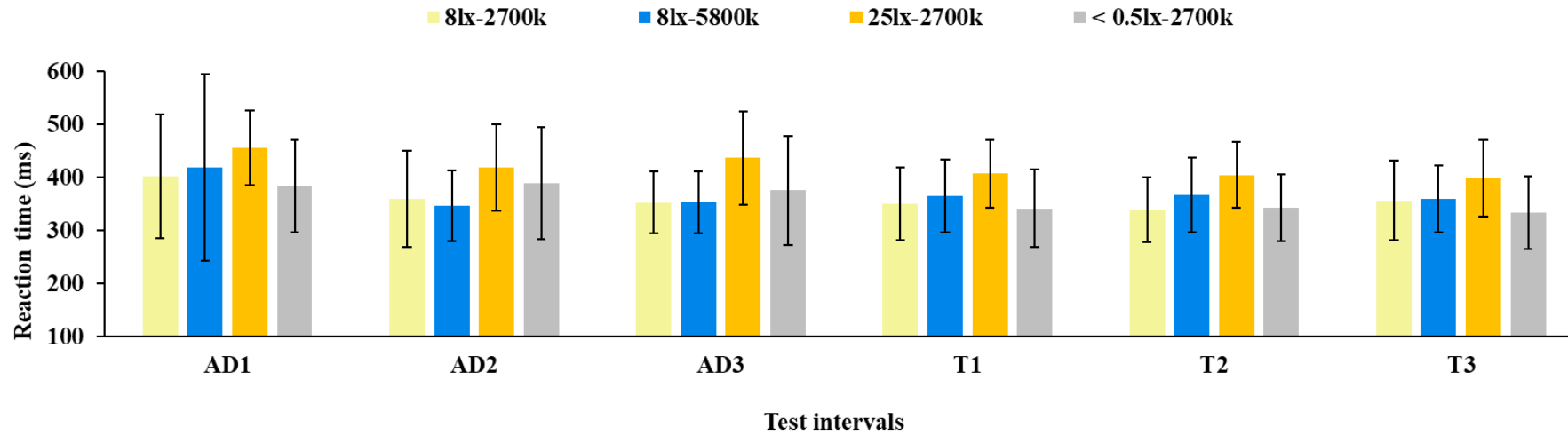
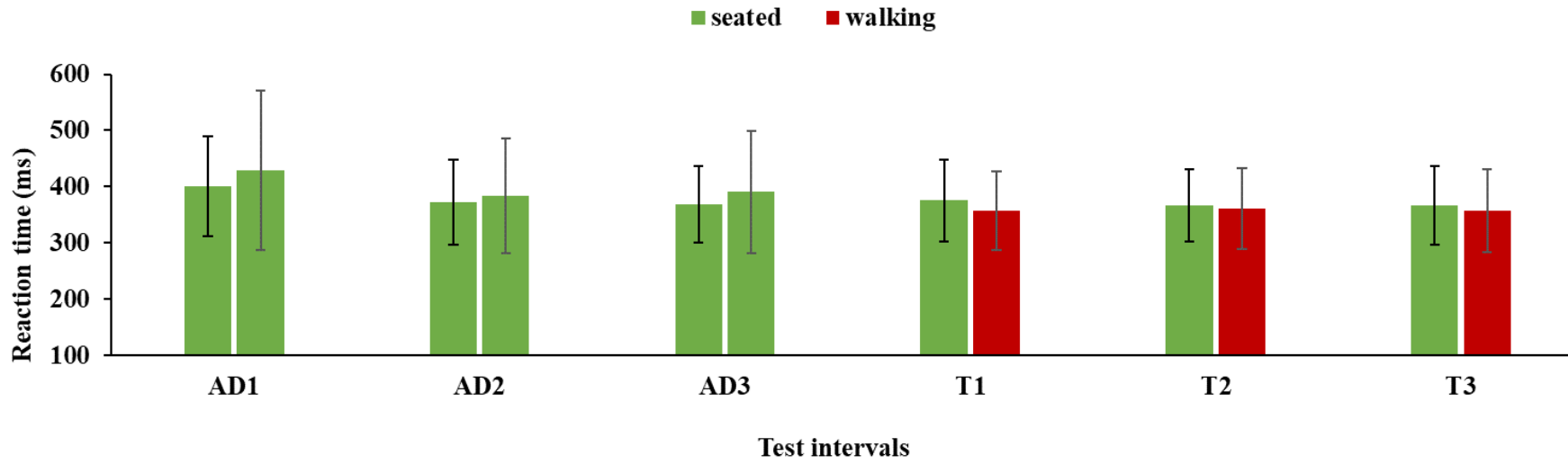
Skin temperature

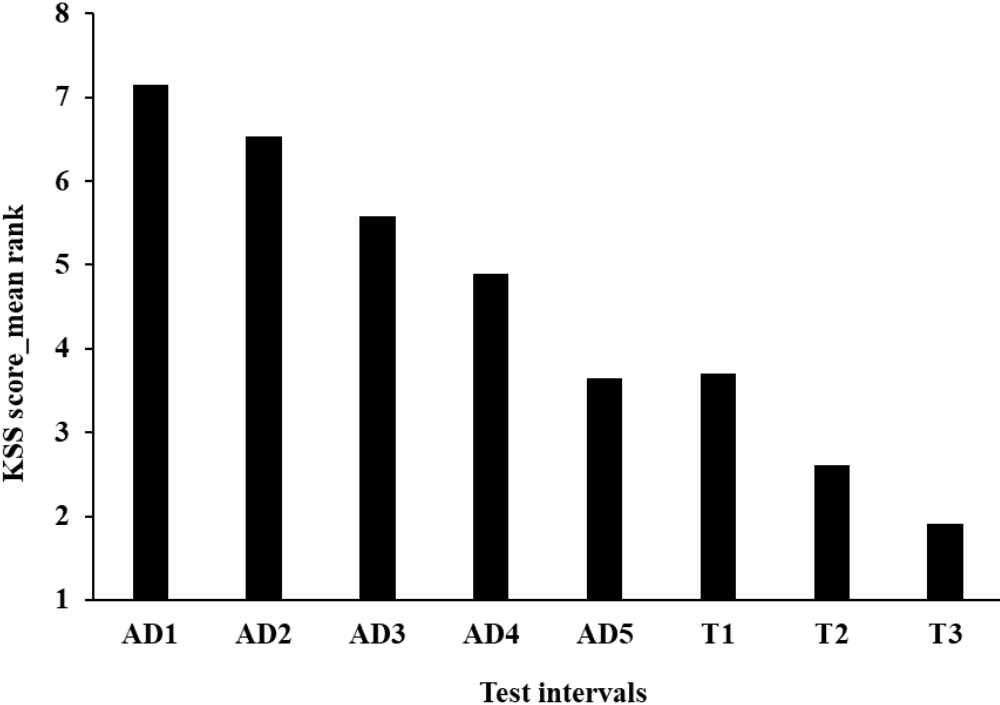


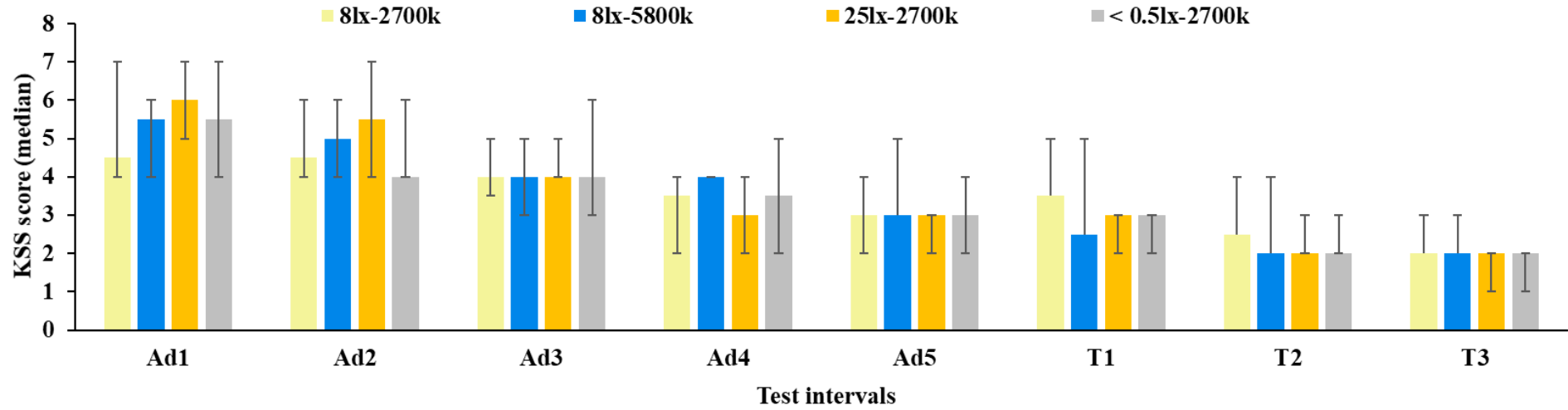
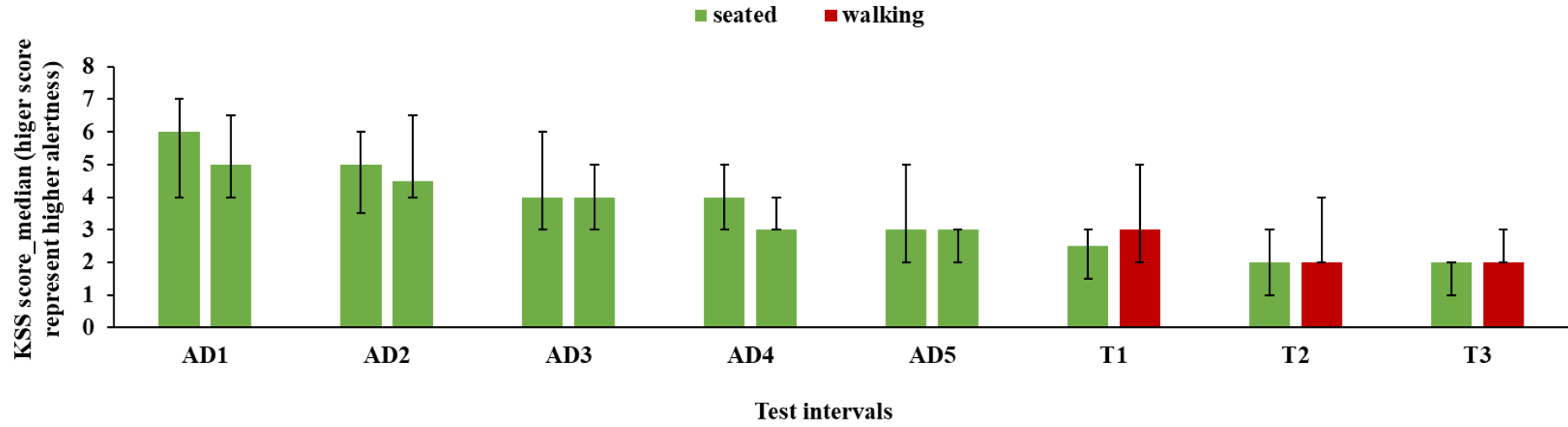
Reaction time



Reaction time







Cognitive workload related problem: responsible for the majority of road accidents

Driver cognitive workload?

- Load from secondary task: e.g., communicating, ...
- Load from activity internal to driver: e.g., planning, thinking about daily activities, ...
- Load from driving task: e.g., vehicle control, decision making, reacting to changes

What can provoke a mental overload while driving:

- Low complex situation: e.g., highway driving
- High complex situation: e.g., town

Can we use specific light spectrum to manipulate cognitive workload and improve peripheral target detection?

Next experiment for pedestrian

Does **pedestrian attention** change as a function of the type of crosswalk under different light conditions ?

Lab experiment

Eye-tracking

