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A method for identifying aggressive driving by using naturalistic driving data

Jordanka Kovaceva, Chalmers University Of Technology, Sweden
Irene Isaksson Hellman, If P&C Insurance, Sweden

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Agenda

- Aim
- Data
- Method
- Results
- Conclusions

Aim

- Identify metrics that can categorize driver behavior associated with higher crash risk
- Aggressive driving in car-following situations
- Investigate effects of drivers characteristics on the identified metrics

UDRIVE

NUMBER OF DRIVERS PER COUNTRY:

EUROPEAN NATURALISTIC
DRIVING STUDY



87871 HOURS OF
DATA COLLECTED

VEHICLE
TYPES



NUMBER OF DRIVERS:

48

186

47

HOURS OF DATA COLLECTED
PER VEHICLE:

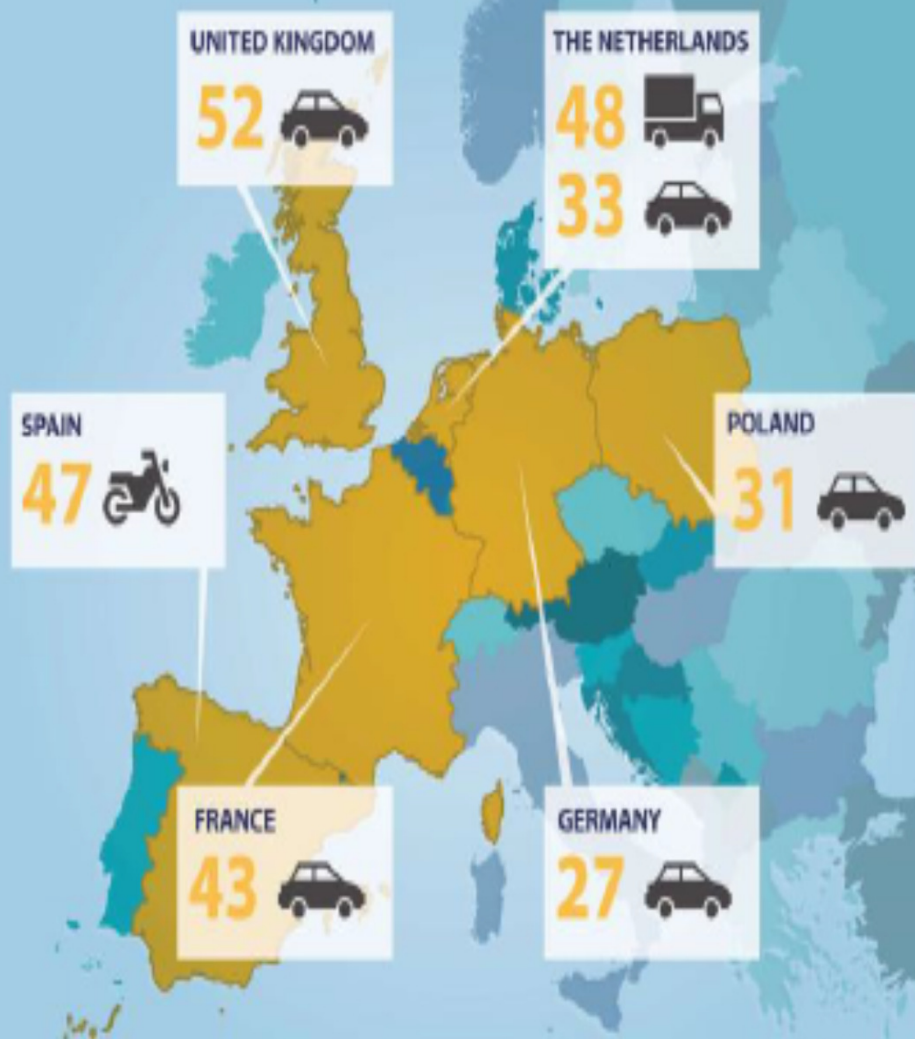
41389

45591

891



NUMBER
OF DRIVERS
281





UDRIVE demonstration
video, non-participant
with consent

CDC data extraction
on 2017-06-20

Questionnaires' data



- Driver Behaviour Questionnaires' (DBQ)
 - 19 items assessing the prevalence of errors and violations in the driver's everyday behaviors
 - High score = more reported aggressive driving violations
- Arnett Inventory of Sensation Seeking (AISS)
 - 20 items assessing the risk-taking and sensation-seeking nature of a driver's personality
 - High score = drivers seek out highly novel or high intensity experiences

-Vehicle sensor (V, a)
-Mobile eye (range)
-Map data (road type)

-Motorway
-No CC

Top 25%

Database

Derive
measures

Select
scenario

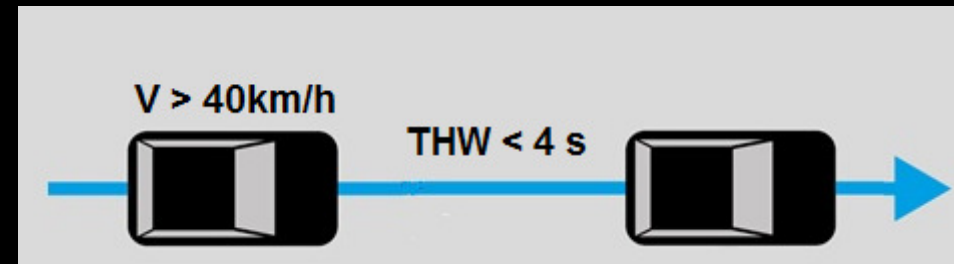
Compute
metrics

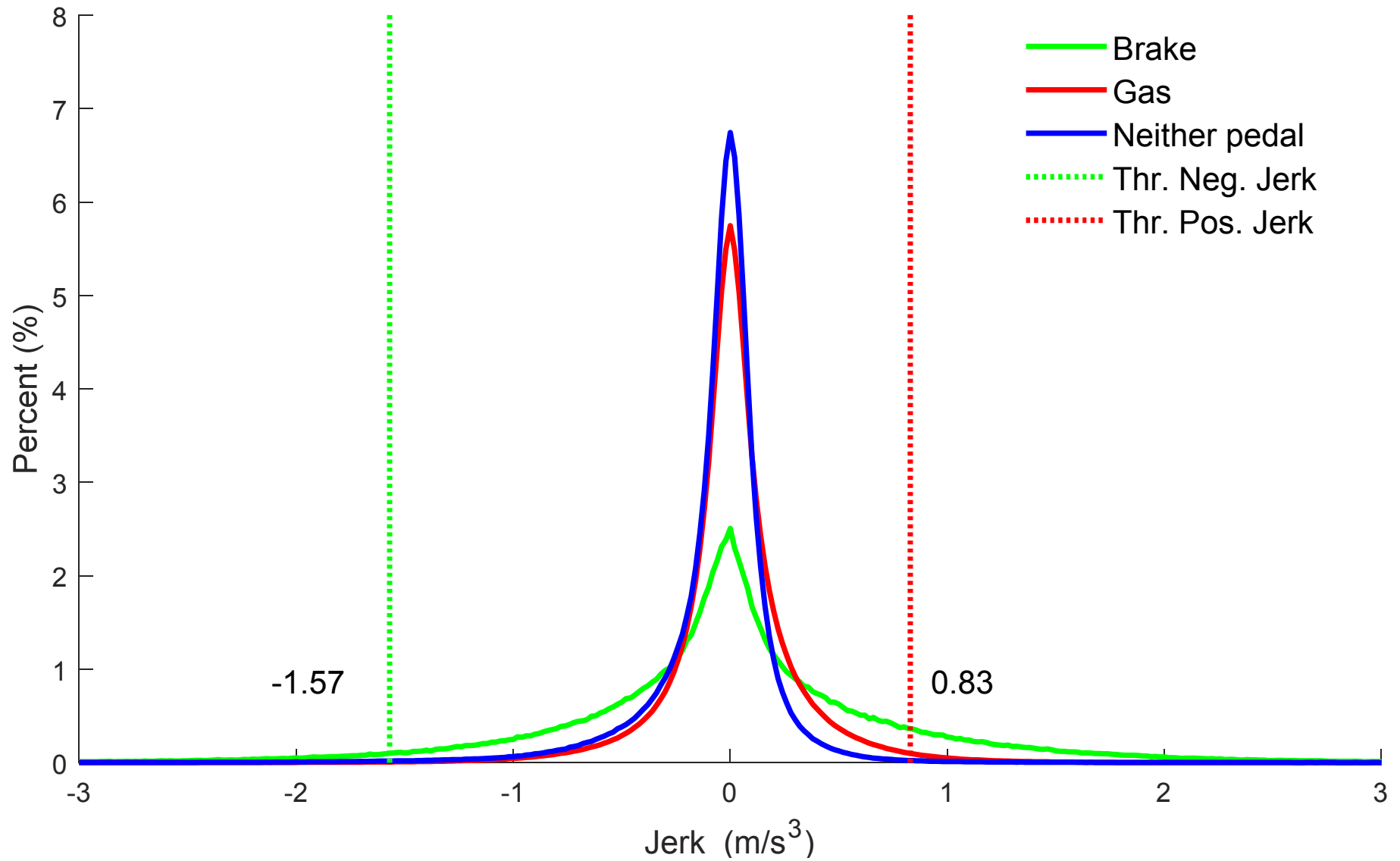
Rank
drivers

-Longitudinal jerk
-THW

$$\% \text{ tailgating} = \frac{THW < 0.4s}{THW < 4s} * 100$$

negative jerk
positive jerk

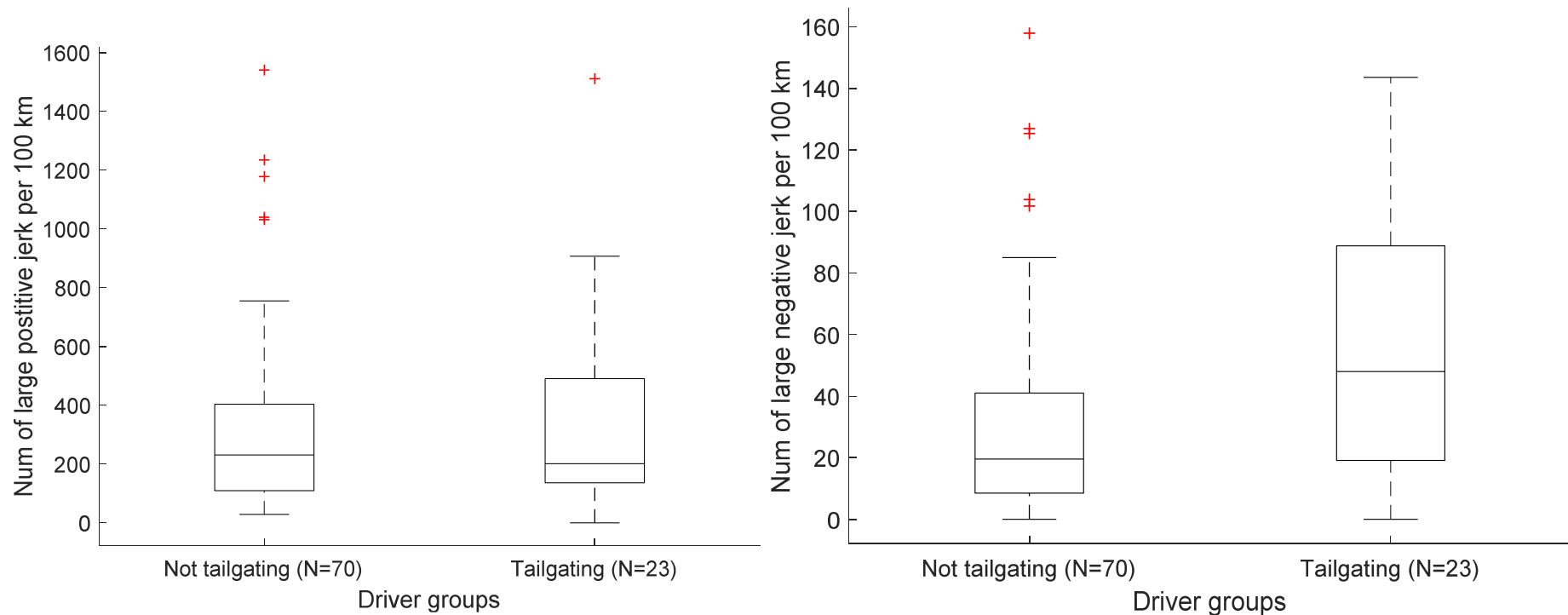




Results

- Total segments of car-following: 126098
- Distance: 72705 km
- Duration: 758.2 hours
- 93 drivers
 - 50 males and 43 females

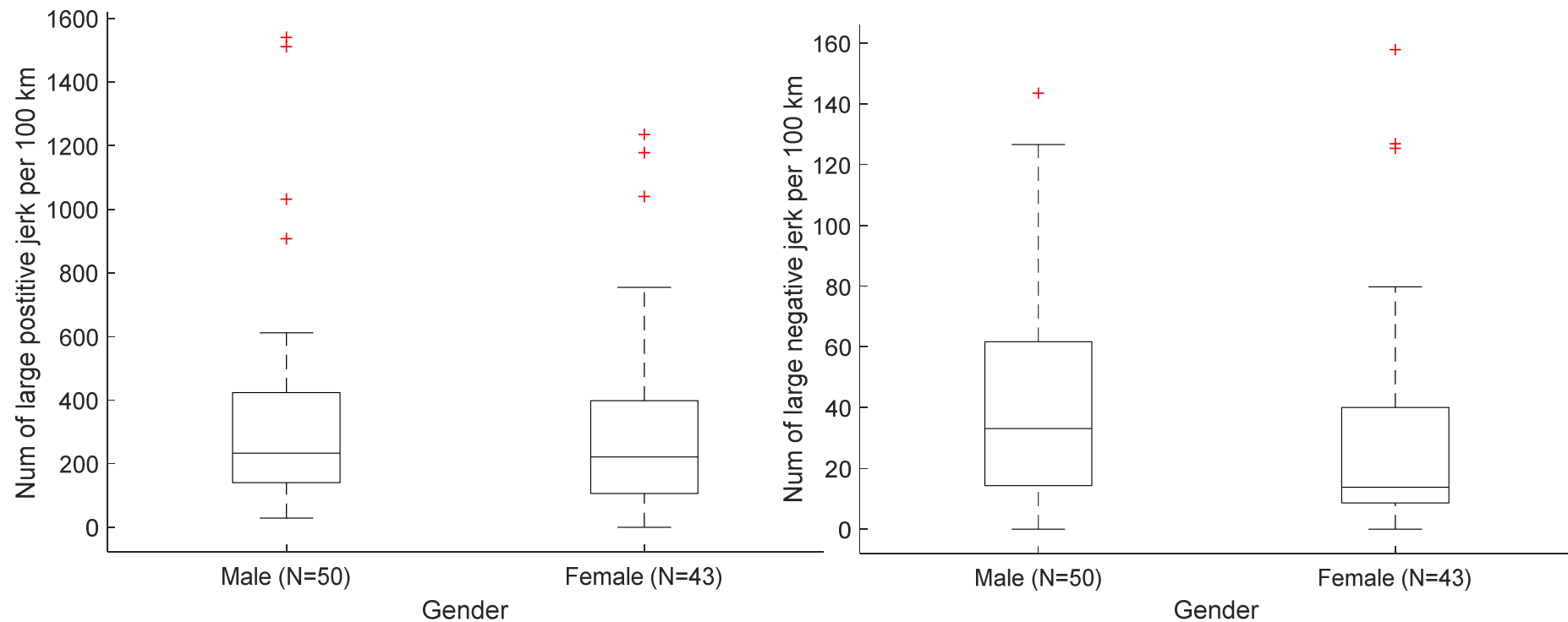
Jerk and tailgating



K-W: $\chi^2 (1) = 0.1605, p = 0.6886$

$\chi^2 (1) = 8.3764, p = 0.0038$

Jerk and gender



K-W: $\chi^2 (1) = 0.8128, p = 0.3673$

$\chi^2 (1) = 6.0431, p = 0.0139$

Jerk and country

- Positive jerk

$$\text{K-W } \chi^2 (4) = 20 \text{ } p = 0.00049$$

- Negative jerk

$$\text{K-W } \chi^2 (4) = 19.51 \text{ } p = 0.00062$$

AISS

- Low AISS group (AISS ≤ 45)
- High AISS group (AISS > 45)
- Tailgate:
 - Fisher exact **p = 0.0139**
- Positive jerk:
 - K-W: $\chi^2(1) = 0.2435$, p = 0.6216
- Negative jerk:
 - K-W: $\chi^2(1) = 1.5286$, p = 0.2163

DBQ

- Low DBQ group (1-3)
- High DBQ group (4-5)
- Tailgate:
 - Fisher exact $p = 0.8604$
- Positive jerk:
 - K-W: $\chi^2(1) = 2.8062$, $p = 0.0939$
- Negative jerk:
 - K-W: $\chi^2(1) = 1.6015$, $p = 0.2057$

Conclusion

- Aggressive drivers are associated with significantly higher frequency of using large **negative** jerk
- Drivers from different countries have significantly different frequency in using both **positive** and **negative** jerk
- Male drivers have significantly higher frequency of using large **negative** jerk compared to female drivers
- Higher sensation-seeking drivers are more prone to tailgating

Thank you