IRTAD 2022

J. **Rogé***

Lyon, 27-09-2022

Improvement of cyclists' conspicuity in urban environment using safety messages for car drivers

VICTIMS project
funded by the Délégation à la Sécurité Routière, France
Convention n°2201104903

C. **Gasne***, A. **Lafont****, C. **Jallais** *, D. **Ndiaye***

*LESCOT UGE **Altran Lab Capgemini

TD. **Nguyen**, F. **Vienne**, PICS-L UGE

JM **Boucheix**, LEAD CNRS-Université de Bourgogne

Université Gustave Eiffel

LABORATOIRE LESCOT
LABORATOIRE ERGONOMIE ET SCIENCES COGNITIVES POUR LES TRANSPORTS

Conspicuity concept

Low conspicuity of the vulnerable road users (VRUs) for motorists

=> high risk of accident or near misses

Sensory Conspicuity

varies according to the physical characteristic of VRUs (retinal angular size, position in the motorist visual field, colour and luminance contrast with the background …)

Cole 1988, Rogé 2019

Cognitive conspicuity

Varies with specific characteristics of car drivers (their experience, their expectations, their temporary intentions …)

Langham 2002, Rogé 2017

Effect of a preventive film on pedestrians and motorcyclists' visibility

Film: preventive messages, testimonies and statistical data analysis (VRUs)

Task: detection of pedestrians and motorcyclists in a simulated road environment

Variable: preventive film "watched or not watched" before driving

Results

Increase of the VRU visibility distance

Increase of the negative emotions' intensity

⇒ Positive effect of the film / pedestrians and motorcyclists visibility

⇒ Implication of emotions ?

Rogé 2015

Persuasive techniques used in road safety campaigns

300 campaigns (41 countries) for the adoption of safety measures Guttman 2016

* Rationale: scientific explanations → cognitive satisfaction

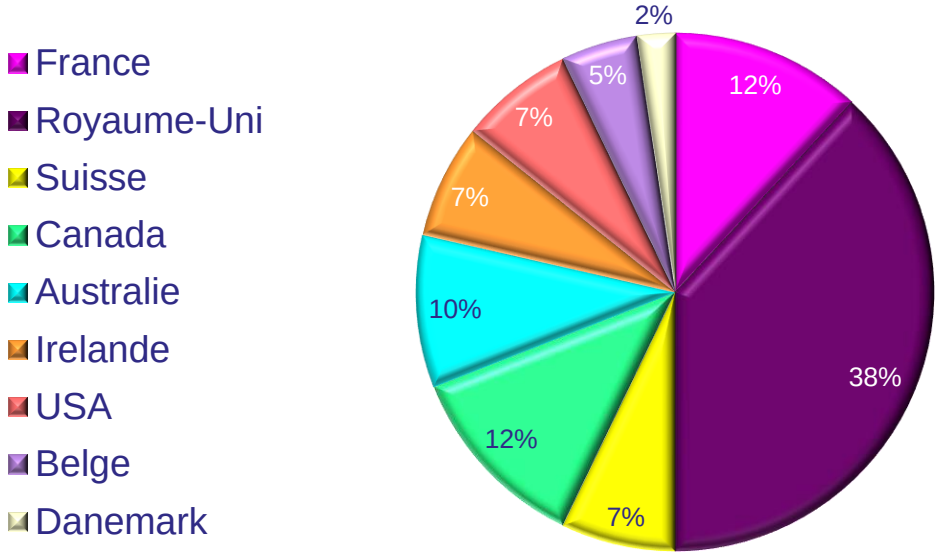
* Humour: entertaining message → capture interest, facility memorization

* Social and ethical values: empathy → increase the positive feelings and the social standards

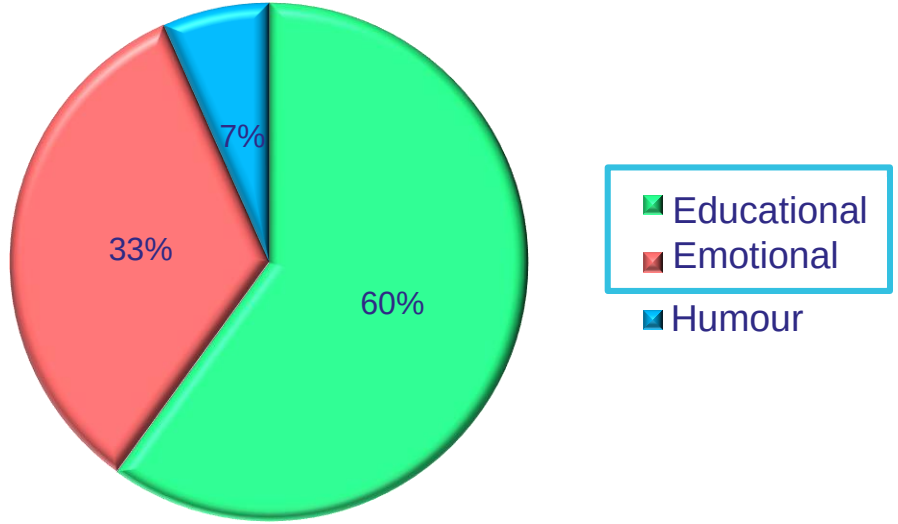
* Threat use: horror of crash → indignation, anger, shame, guilt

!!! If the intensity of emotions too high => reactance response (rejection and distancing) Hoekstra 2011

Cyclist campaigns' inventory



Percentage of the preventive films related to cyclist safety by country (45 available on internet 2018)



Percentage of the preventive films related to cyclist safety by communication mode

* Heterogeneity of the preventive films: communication mode, duration, topic, and making of the films

=> Create original messages in order to compare their effect

* Messages aimed at motorists,

interactions between motorists and cyclists

- Safe distance
- Excessive speed
- Door opening
- Right-turn situation
- Cell Phone use

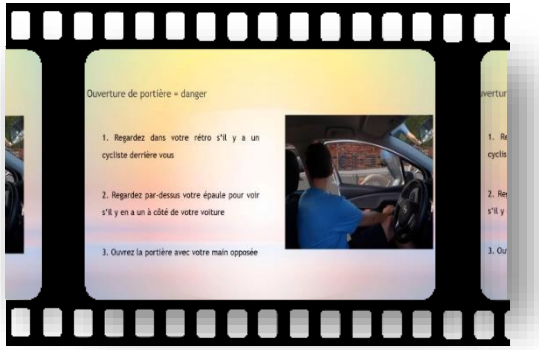
Université Gustave Eiffel

Common features of preventive films

- Making of the films: overlay of a real driver and car in a simulated environment
- A final short preventive sentence identical for the 2 communication modes
- Duration: 31s

≠

Emotional films	Educational films	Neutral films
Dynamic images	Static images	Dynamic images
Injured cyclist	~~Injured~~ cyclist	~~Cyclist~~
The inevitability of the crash	Practical guidance if possible	Images from nature



Objective: Study the effect of the short films watched before driving on car drivers

Hypothesis

H1 Car drivers will estimate the emotional films more effective than the educational ones

H2 The preventive films will help the car drivers to detect the cyclists during driving,

particularly the emotional ones

Population

57 men (25.4 years old), driving license (6.4 years)

Randomised in 3 groups (19)

Each participant watched 5 films belonging to a specific category (educational or emotional or neutral one)

~~Interference between the films~~

Course of the experiment

Projection 1

Rest | Film 1 | Film 2 | Film 3 | Film 4 | Film 5

Recall task

Projection 2

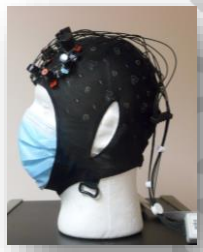
Film 1 | Film 2 | Film 3 | Film 4 | Film 5

Questionnaires

Driving

Phase 1 | Phase 2

2h30

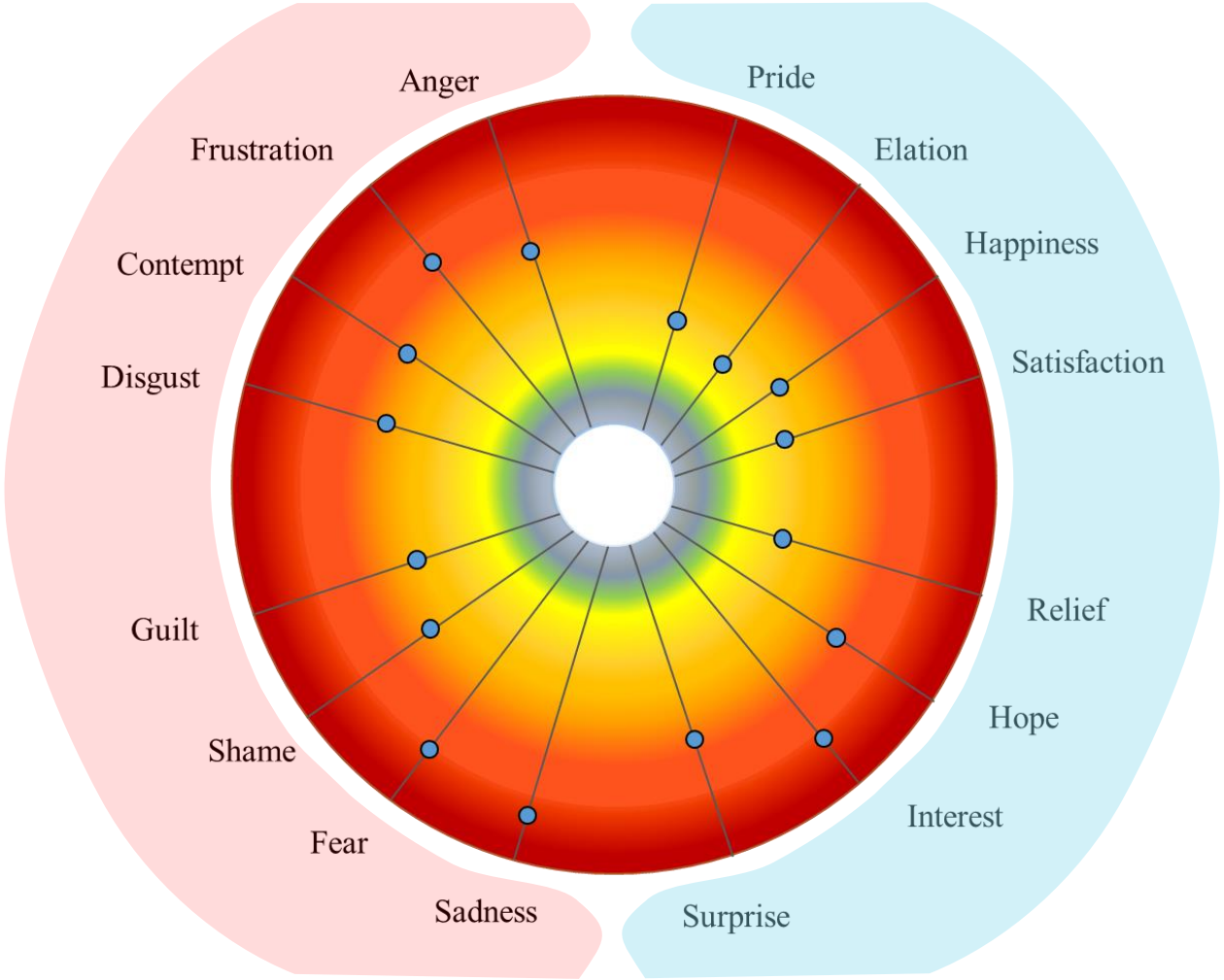


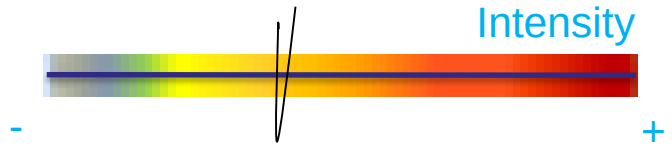
ΔHbO dans le cortex préfrontal

Mood Box

Driving

The emotional wheel

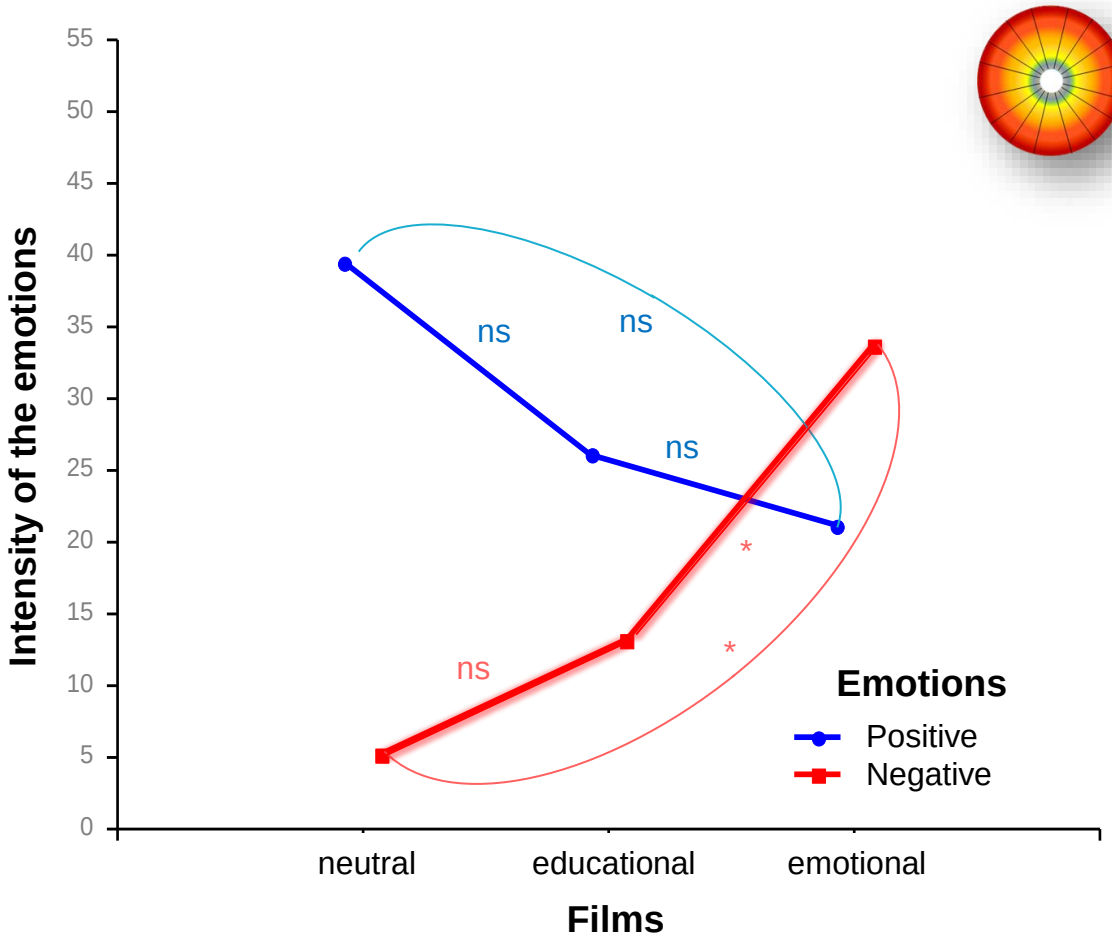




Mean of intensity

- for the positive emotions (8)
- for the negative emotions (8)

Emotion intensity as a function of the communication mode and the valence of emotions



Mean of intensity

- for the positive emotions (8)
- for the negative emotions (8)

Non parametric tests

57 participants (3 groups)

==> Ability to self-assess and to report the emotions felt during the films watching

No significant effect of the communication mode on the positive emotion intensity

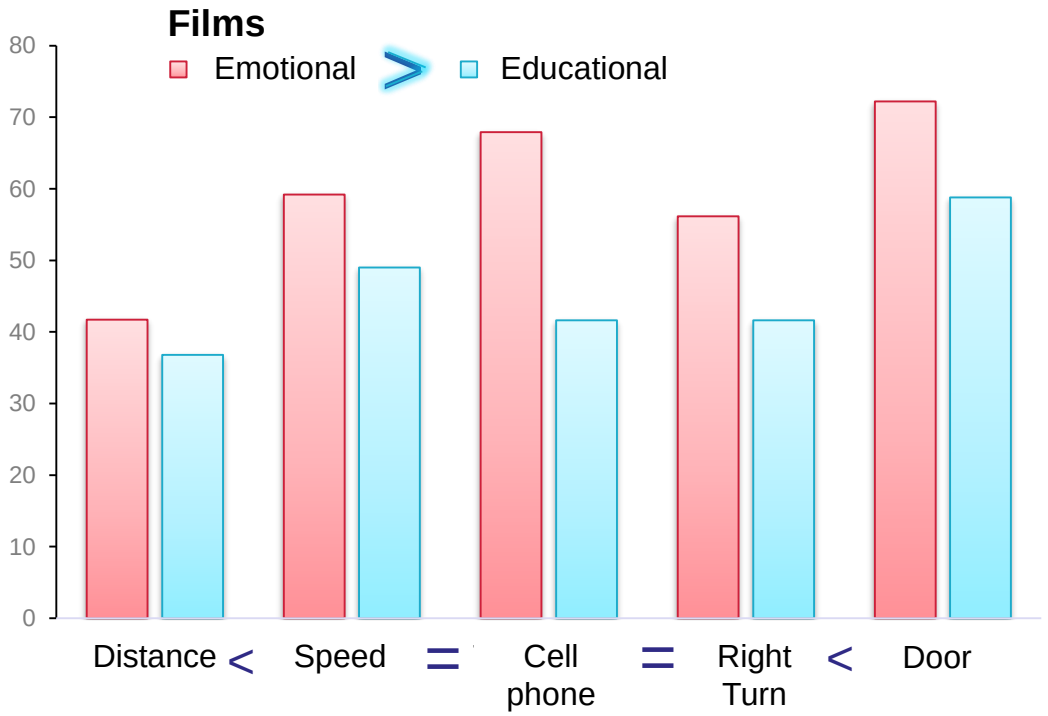
Negative emotions intensity varies according to the communication mode

Efficiency

ANOVA: Communication mode², Topic⁵

38 participants (2 groups)

Efficiency of the preventive films for the 2 communication modes and by topic



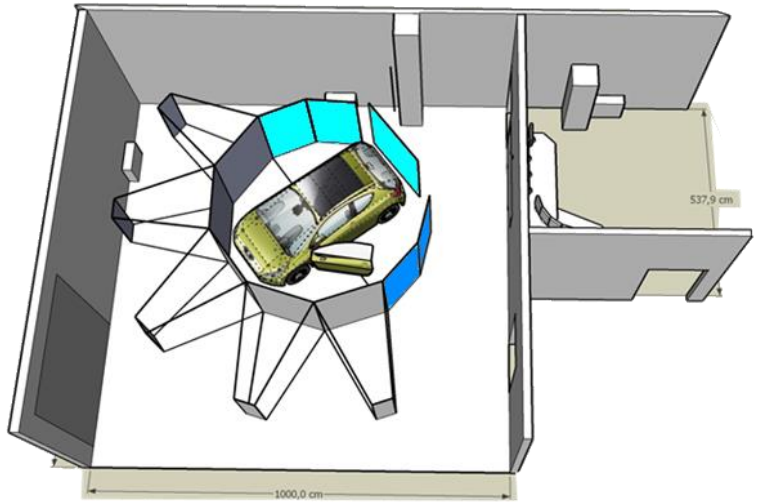
Significant effect of the topic

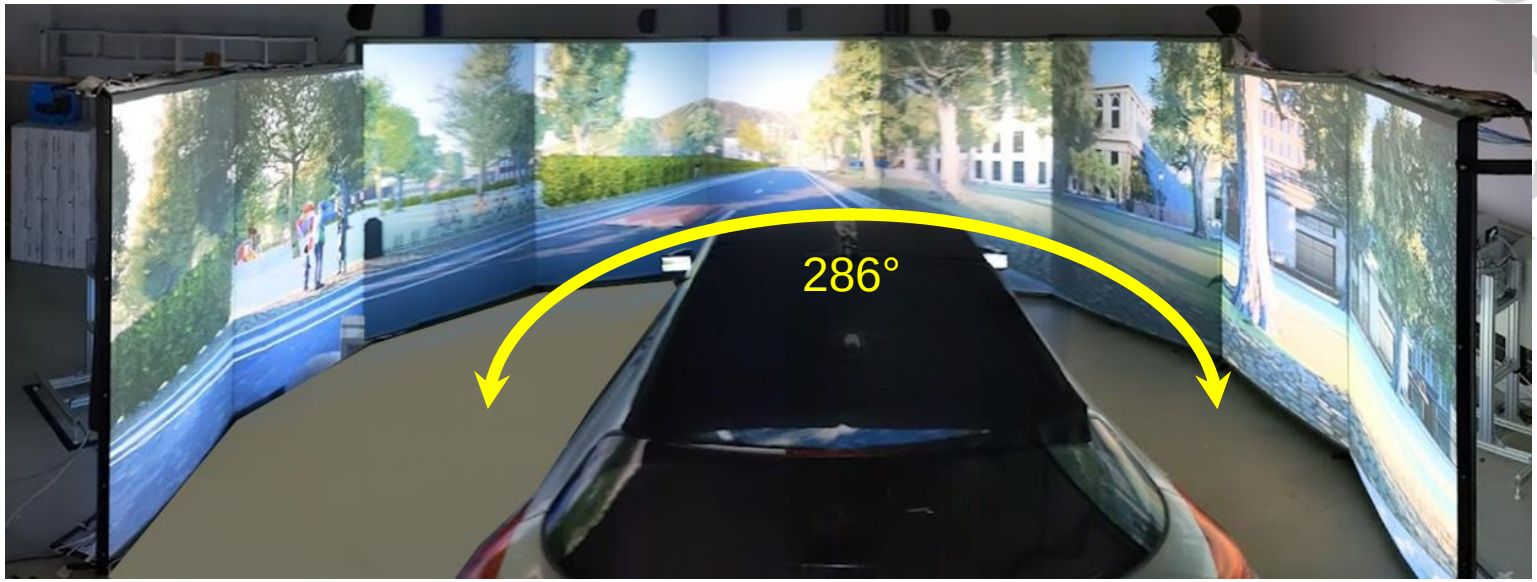
Significant effect of the communication mode

H1

Université Gustave Eiffel

Car driving simulator





Fixed base simulator

Front view: 9 screens (back screen projection)

Back view

- Inside mirror (front screen projection)
- Exterior mirrors (2 screens of 7 pouces)

Simulated urban environment

Area = 6 km²

Instructions

- reach a specific location
- comply with traffic laws
- detect VRUs (pedestrians and cyclists)

VRUs detection task

31 cyclists

51 pedestrians

other vehicles (cars, vans, buses, trucks)

VRUs detection task

Distractors

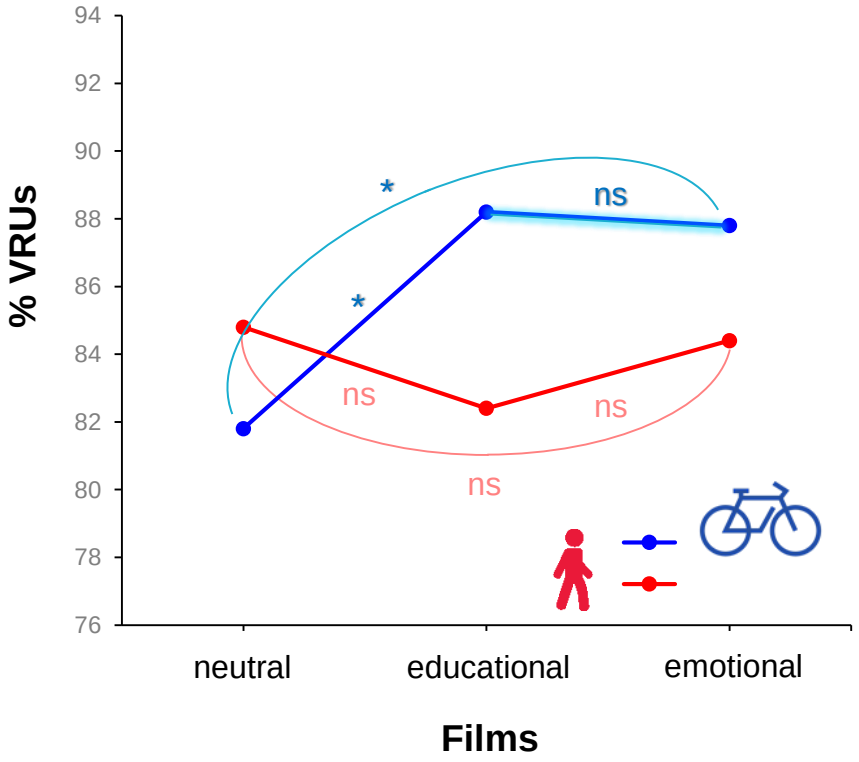
Slow vehicles

VRUs detection

ANOVAs: Communication mode[3], VRU type[2]

57 participants

Percentage of detected VRUs while driving as a function of communication mode and type of VRUs



Interaction of VRU type and communication mode

% of detected pedestrians →

% of detected cyclists ↗

==> Cyclists' cognitive conspicuity enhanced by preventive films

= { Pedestrians and motorcyclists (Rogé 2015)
  { Cyclists (Lafont 2021)

==> **Information** about critical situations involving cyclists and car drivers

is **more important** than the **communication mode** of the preventive message

H2

Université Gustave Eiffel

→ Assessed efficiency of the preventive films

Emotional films > Educational films

≠

→ Percentage of detected cyclists

Emotional films = Educational films

Declarative data:

~~Indicator~~

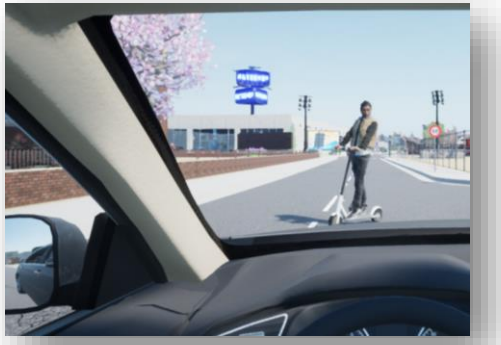
real efficiency of the preventive messages ?

==> Advantages of advanced simulators to evaluate the impact of preventive messages

- critical situations without taking risks
- collection of objective data (VRUs detection)

High realism level !

Simulator sickness !



And after …..

Conspicuity of e-scooter users for car drivers

Immersive Virtual Reality technique to improve the visibility of the e-sccoter

Université Gustave Eiffel

Thank you for your attention

Université Gustave Eiffel

Joceline ROGE

joceline.roge@univ-eiffel.fr