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Key results on vulnerable road users' performance and attitudes across 39 countries

Dr Eva Michelaraki

Civil Transportation Engineer, National Technical University of Athens

Together with: K. Kaselouris, D. Nikolaou, U. Meesmann, N. Wardenier, A. Ziakopoulos & G. Yannis

National Technical University of Athens, Greece
Vias institute, Belgium
University of Liège, Belgium

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Introduction

- **1.19 million people** were killed due to road crashes in 2021.
- Vulnerable Road Users (VRUs) account for **half** of all road fatalities worldwide.
- Vulnerable Road Users (VRUs), such as pedestrians, cyclists and moped riders and motorcyclists, face **heightened risks** in traffic environments due to their lack of physical protection compared to vehicle occupants.

Background

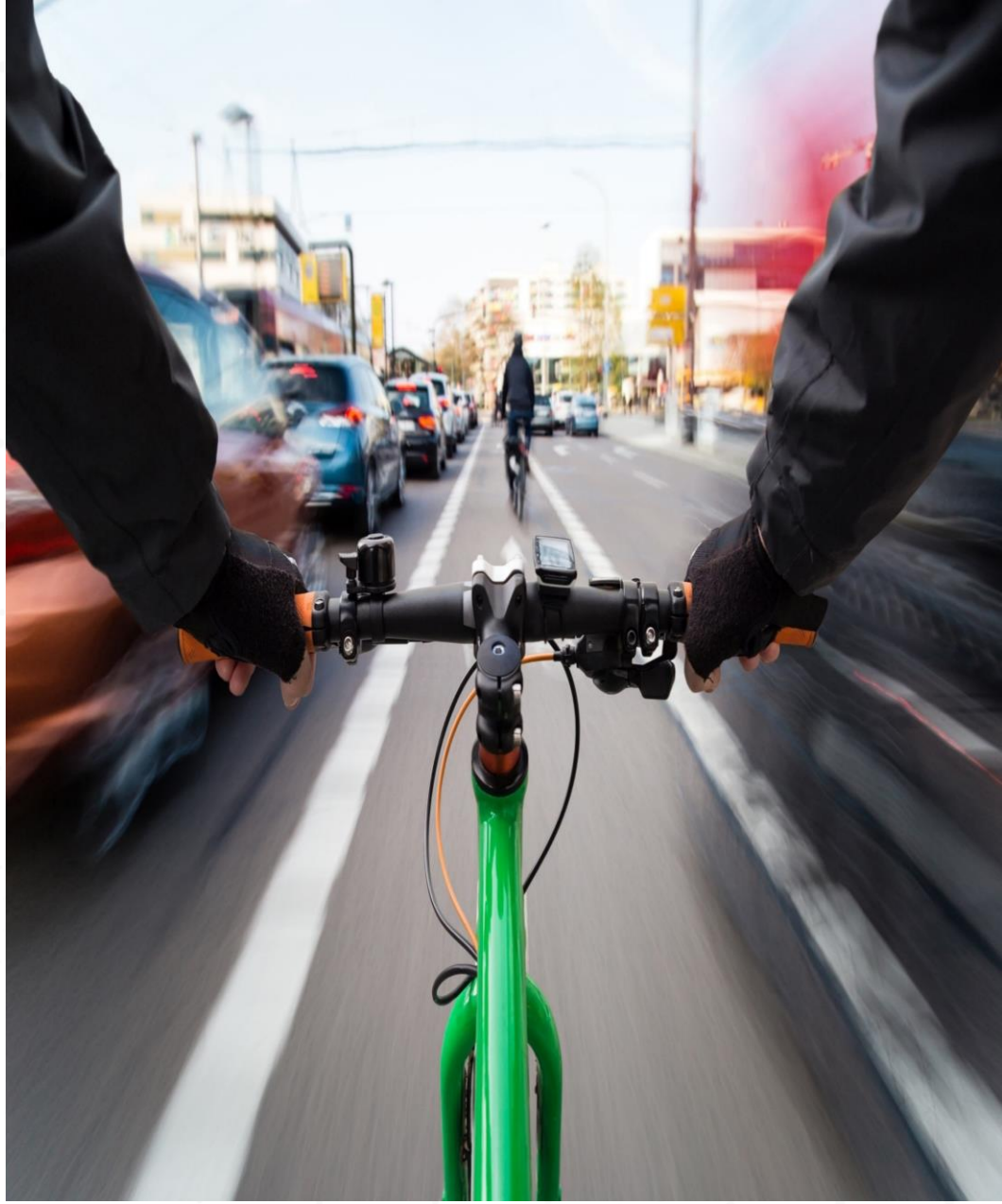
- Pedestrians account for 21% of all road traffic deaths globally, while cyclists account for 5% and moped riders and motorcyclists for 30% of total road fatalities worldwide (WHO, 2023).
- **Pedestrians** are among the most vulnerable road users due to their complete lack of physical protection in traffic environments.
- The most important factors of **cyclists'** crashes are related to an inherently unsafe traffic system, respectively unsafe infrastructure (ITF/OECD, 2023).
- Key factors contributing to crashes with a **moped or a motorcycle** include speeding, poor road conditions, and inadequate use of protective equipment (Konlan & Hayford, 2022).

Research Objectives

- Provide a quantified update on VRU safety performance by **analyzing** data from a broad-country sample (39 countries) which were collected within the framework and activities of the ESRA3 study conducted in 2023
- Investigate the **attitudes and opinions** of pedestrians, cyclists and moped riders and motorcyclists concerning:

  (i) their safety perceptions of specific transport modes and

  (ii) various types of unsafe behaviour



Safety perception of using each transport mode

Country	Pedestrian	Bicycle (non-electric)	Bicycle (electric)	Moped	Motorcyclist
Armenia	8.2 (↑)	6.6	2.8 (↓)	4.7 (↓)	6.8 (↑)
Australia	7.9	7.0	7.1 (↑)	7.1 (↑)	7.3 (↑)
Austria	7.9	6.8	6.8	6.1	6.4
Belgium	6.9	5.8	5.9	6.0	6.1
Bosnia & Herzegovina	7.1	6.1	5.5	5.8	5.2
Brazil	6.4	6.1	6.2	5.9	5.7
Canada	7.8	6.8	6.6	6.4	6.2
Chile	6.3	5.6	5.3	4.8 (↓)	5.0
Colombia	5.8 (↓)	5.4 (↓)	5.0	5.0	5.3
Czech Republic	7.4	6.1	5.8	5.5	5.5
Denmark	8.2 (↑)	7.1	6.8	6.1	6.1
Finland	8.0	7.4 (↑)	7.2 (↑)	6.5	6.1
France	6.9	6.1	6.9	7.0 (↑)	6.5
Germany	7.7	7.0	6.7	6.4	6.3
Greece	6.9	5.3 (↓)	4.8 (↓)	5.2	5.1
Ireland	7.4	5.8	6.2	5.7	6.3
Israel	8.2 (↑)	5.9	5.2	5.2	4.6 (↓)
Italy	6.8	5.8	5.5	5.6	5.8
Japan	7.2	5.8	5.9	4.9	4.4 (↓)
Kazakhstan	7.9	6.5	5.8	5.4	5.3
Kyrgyzstan	7.8	6.3	5.4	3.9 (↓)	3.8 (↓)
Latvia	7.5	6.6	5.7	5.7	6.2
Luxembourg	6.6	5.6	5.7	5.5	6.0
Mexico	6.4	5.9	5.8	5.3	5.5
Netherlands	7.6	6.9	6.7	5.8	5.5
Panama	6.2 (↓)	5.4	5.0	4.8 (↓)	4.7
Peru	6.2 (↓)	5.3 (↓)	4.7 (↓)	4.8 (↓)	4.9
Poland	6.9	6.5	5.9	5.4	5.2
Portugal	7.7	6.3	6.3	6.2	6.1
Serbia	7.4	6.3	5.5	5.2	5.4
Slovenia	7.9	6.3	5.3	5.3	5.4
Spain	7.8	5.9	5.6	5.2	5.5
Sweden	7.2	6.8	6.5	6.1	6.0
Switzerland	8.0	6.7	6.5	6.2	6.5
Thailand	6.9	7.0	6.9	6.7	6.6
Türkiye	6.6	5.8	5.4	5.3	5.0
United Kingdom	8.2 (↑)	6.2	6.8	5.9	5.7
United States	7.7	7.7 (↑)	7.8 (↑)	7.8 (↑)	7.6 (↑)
Uzbekistan	9.0 (↑)	7.2 (↑)	5.9	5.4	5.0
Europe22	7.5	6.4	6.3	6.0	5.9
America8	7.0	6.6	7.0	7.0	6.6
AsiaOceania6*	7.1	6.3	6.1	6.1	6.0

Note: (↑) indicates the three highest safety perception scores while (↓) the lowest three.

- Regarding walking, European respondents felt **the safest** when compared to other regions.
- The highest safety perception scores among people using both **conventional and electric bicycles** are found in the United States.
- For **moped riders and motorcyclists**, American respondents felt the most safe when compared to other regions.

Pedestrians' self-declared behaviour

Country	Walk while wearing headphones	Walk when you think you may have had too much to drink	Read a message or check social media/news while walking	Text a message while walking	Cross the road when a pedestrian light is red	Cross the road at places other than at a nearby pedestrian crossing
Armenia	33.0%	18.0% (↓)	60.9%	50.9%	25.0% (↓)	43.6% (↓)
Australia	42.2%	23.7%	47.6% (↓)	46.9%	31.1%	50.1% (↓)
Austria	40.8%	43.2% (↑)	69.3%	61.6%	42.4%	74.2%
Belgium	40.8%	33.8%	61.3%	61.7%	38.9%	64.1%
Bosnia & Herzegovina	33.2%	27.0%	76.9%	77.6% (↑)	37.6%	74.4%
Brazil	65.4% (↑)	26.0%	71.6%	67.4%	51.2%	62.4%
Canada	52.1%	26.3%	57.5%	58.9%	40.4%	69.8%
Chile	70.5% (↑)	31.2%	76.4%	73.4%	55.5%	75.7%
Colombia	65.2%	34.3%	70.3%	68.6%	51.3%	79.3%
Czech Republic	41.5%	40.9%	66.7%	63.5%	38.0%	73.1%
Denmark	52.1%	40.9%	72.7%	71.6%	46.9%	69.4%
Finland	53.7%	41.1% (↑)	72.2%	66.4%	54.2%	80.3% (↑)
France	38.0%	24.3%	54.3%	51.3%	51.0%	58.6%
Germany	32.1% (↓)	30.1%	52.5%	45.6% (↓)	33.3%	54.8%
Greece	53.7%	30.8%	80.7%	75.6%	57.1%	80.0% (↑)
Ireland	60.7%	44.4% (↑)	75.2%	66.8%	61.6% (↑)	79.5% (↑)
Israel	57.1%	21.5%	83.8% (↑)	83.5% (↑)	44.5%	68.6%
Italy	50.0%	23.5%	72.0%	74.0%	35.9%	68.2%
Japan	25.2% (↓)	22.8%	38.6% (↓)	35.9% (↓)	37.1%	53.8%
Kazakhstan	54.6%	28.3%	77.7%	68.7%	18.8% (↓)	53.8%
Kyrgyzstan	40.3%	8.6% (↓)	59.1%	55.5%	10.9% (↓)	51.4%
Latvia	40.2%	32.2%	68.7%	65.1%	47.3%	71.6%
Luxembourg	41.9%	40.3%	81.5% (↑)	78.4% (↑)	54.3%	76.9%
Mexico	63.3%	30.2%	71.8%	70.8%	49.0%	75.2%
Netherlands	43.5%	35.8%	61.9%	65.4%	45.7%	67.5%
Panama	62.8%	20.1%	69.8%	69.6%	29.6%	62.8%
Peru	72.4% (↑)	37.3%	76.6%	76.6%	53.5%	76.9%
Poland	41.3%	30.2%	53.6%	46.5%	28.8%	64.8%
Portugal	50.9%	27.2%	82.2% (↑)	76.8%	59.9% (↑)	74.5%
Serbia	35.8%	22.8%	77.9%	77.0%	40.3%	76.2%
Slovenia	28.4% (↓)	27.9%	62.4%	53.7%	29.3%	69.0%
Spain	59.4%	39.2%	81.4%	75.7%	67.3% (↑)	79.2%
Sweden	59.8%	37.4%	76.0%	70.1%	58.6%	78.4%
Switzerland	47.8%	38.8%	64.6%	63.0%	43.9%	65.1%
Thailand	53.6%	37.3%	60.1%	56.9%	37.7%	62.5%
Türkiye	58.8%	23.0%	63.2%	65.1%	36.4%	50.5%
United Kingdom	44.5%	36.2%	57.8%	56.0%	47.9%	67.8%
United States	39.9%	22.4%	38.1% (↓)	38.1% (↓)	27.4%	42.0% (↓)
Uzbekistan	64.5%	15.1% (↓)	70.4%	73.2%	44.5%	57.2%
Europe22	44.2%	31.8%	63.7%	60.3%	44.6%	66.8%
America8	55.0%	26.5%	58.4%	57.0%	41.3%	59.3%
AsiaOceania6*	43.4%	25.9%	53.3%	51.6%	35.7%	54.6%

Note: (↑) indicates the three highest safety perception scores while (↓) the lowest three.

- Crossing the road at **places other than at a nearby pedestrian crossing** records the highest rates in all examined regions.
- Under 50% of respondents declared that in the past 30 days they had walked down the street when they think they may **have had too much to drink** at least once.
- Pedestrians who are more likely to admit **listening to music** through headphones while walking down the street are from America.
- The highest rates of **reading a text message/email or checking social media** while walking on the street were observed in Israel (83.8%).
- European pedestrians report the highest percentages of **red light crossing.**
- In the majority of ESRA3 participating countries, over 50% of respondents declared that they had **crossed the road at places other than a pedestrian crossing** at least once.

Cyclists' self-declared behaviour

Country	Cycle when you think you may have had too much to drink	Cycle without a helmet	Cycle while wearing headphones	Read a message or check social media/news while cycling	Cycle within 1 hour after taking drugs	Cross the road when a traffic light is red
Armenia	4.9% (↓)	58.5%	39.1%	9.6% (↓)	0.0% (↓)	26.9%
Australia	11.8%	13.2% (↓)	28.1%	14.6%	10.9%	14.8% (↓)
Austria	17.0%	62.8%	29.5%	16.2%	6.8%	24.6%
Belgium	25.0%	69.9%	33.5%	22.7%	12.5%	27.7%
Bosnia & Herzegovina	8.9%	69.5%	31.8%	25.2%	4.8%	23.8%
Brazil	13.5%	53.7%	59.1%	28.4%	8.2%	38.4% (↑)
Canada	19.0%	47.4%	42.8%	22.1%	18.8% (↑)	31.8%
Chile	14.7%	63.9%	65.1%	29.6%	9.5%	38.2%
Colombia	10.7%	61.8%	68.7% (↑)	29.0%	10.1%	37.8%
Czech Republic	25.0%	70.7%	33.2%	16.0%	6.4%	21.5%
Denmark	31.3% (↑)	64.0%	44.3%	29.3%	11.1%	33.4%
Finland	23.0%	69.2%	44.0%	24.2%	4.5%	36.2%
France	16.0%	50.5%	29.7%	21.2%	10.4%	24.5%
Germany	15.8%	57.8%	25.4% (↓)	18.2%	6.1%	24.2%
Greece	8.9%	56.0%	42.5%	18.8%	4.0%	21.6%
Ireland	20.4%	51.6%	46.4%	26.8%	16.3%	34.3%
Israel	9.9%	35.0%	48.1%	34.1% (↑)	11.7%	31.6%
Italy	10.8%	64.2%	41.9%	19.3%	8.6%	22.5%
Japan	7.2%	64.2%	13.1% (↓)	11.2% (↓)	4.9%	31.4%
Kazakhstan	13.9%	77.9%	56.6%	28.1%	12.6%	15.0%
Kyrgyzstan	0.0% (↓)	81.3%	50.1%	21.2%	2.9% (↓)	7.2% (↓)
Latvia	12.9%	85.2% (↑)	37.5%	16.4%	2.9% (↓)	26.8%
Luxembourg	5.9% (↓)	39.8%	22.9%	14.4% (↓)	5.0%	32.5%
Mexico	16.9%	63.4%	60.3%	27.7%	14.7%	41.4% (↑)
Netherlands	32.0% (↑)	88.3% (↑)	35.9%	24.1%	15.2%	40.6% (↑)
Panama	10.3%	62.4%	68.4% (↑)	30.4%	6.4%	24.7%
Peru	13.2%	66.7%	76.8% (↑)	33.6% (↑)	10.1%	35.8%
Poland	10.6%	79.7%	40.1%	23.1%	4.7%	14.8% (↓)
Portugal	11.5%	48.8%	42.5%	17.3%	9.8%	29.2%
Serbia	8.7%	83.4%	29.3%	22.2%	3.3%	15.5%
Slovenia	15.2%	65.2% (↑)	21.2% (↓)	15.1%	5.3%	24.2%
Spain	17.0%	52.0%	43.2%	23.5%	14.1%	34.2%
Sweden	27.4% (↑)	70.0%	49.6%	31.3%	7.7%	35.3%
Switzerland	20.1%	52.2%	35.8%	21.3%	10.4%	26.4%
Thailand	23.0%	59.2%	50.9%	31.5%	30.6% (↑)	35.8%
Türkiye	9.1%	53.7%	52.2%	17.2%	6.2%	29.7%
United Kingdom	15.1%	31.6% (↓)	37.6%	16.7%	13.0%	16.5%
United States	14.1%	23.2% (↓)	39.0%	18.3%	15.3%	20.1%
Uzbekistan	24.1%	63.1%	45.5%	42.3% (↑)	19.2% (↑)	33.3%
Europe22	16.4%	60.4%	35.5%	20.6%	9.1%	24.7%
America8	14.3%	42.9%	51.4%	24.0%	12.8%	30.5%
AsiaOceania6*	12.8%	56.5%	36.4%	19.5%	13.3%	30.3%

Note: (↑) indicates the three highest safety perception scores while (↓) the lowest three.

- Cycling **without using a helmet** was the most frequently mentioned unsafe behaviour.
- The percentage of cyclists indicating that they cycled when they might have **consumed too much alcohol** at least once in the past 30 days is similar in all examined regions.
- The proportion of cyclists **without a helmet** differed considerably from one country to another within the world regions.
- Regarding cyclist's **distraction**, cycling while listening to music through headphones varies from 35.5% in Europe to 51.4% in America.
- The three countries with the highest proportion of **cycling within 1 hour after taking drugs** (other than prescribed or over the counter medication are Thailand (30.6%), Uzbekistan (19.2%) and Canada (18.8%).
- Under 50% of respondents declared that in the past 30 days they **crossed the road when a traffic light was red.**

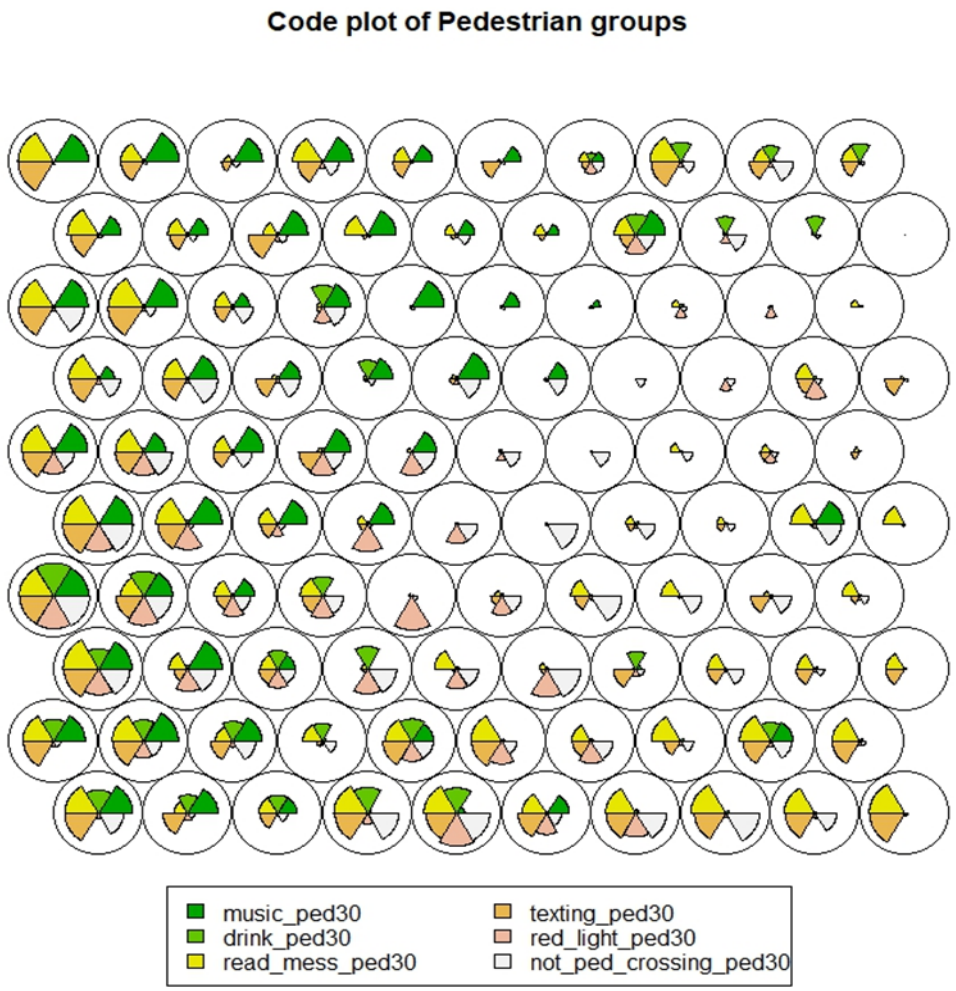
Moped riders and motorcyclists' self-declared behaviour

Country	Drink driving	Ride faster than the speed limit outside built-up areas (except motorways/freeways)	Ride without a helmet	Read a message or check social media/news while riding	Ride within 1 hour after taking drugs	Ride too fast for the road/traffic conditions at the time
Armenia	0.0% (↓)	37.4%	24.8%	0.0%(↓)	0.0% (↓)	0.0% (↓)
Australia	10.5%	18.0% (↓)	13.7% (↓)	11.9%	13.6%	13.0% (↓)
Austria	19.7%	58.8%	19.4%	20.8%	17.1%	49.1% (↑)
Belgium	27.5%	43.4%	32.9%	28.2%	24.5%	32.0%
Bosnia & Herzegovina	13.6%	35.3%	52.0% (↑)	18.1%	9.2%	36.3%
Brazil	15.2%	39.1%	23.8%	22.6%	14.2%	27.6%
Canada	26.8%	39.8%	29.9%	27.3%	26.4%	30.3%
Chile	20.3%	36.0%	37.3%	35.3%	17.4%	33.3%
Colombia	15.6%	45.7%	36.9%	32.7%	14.6%	41.9%
Czech Republic	21.7%	54.0%	32.0%	18.9%	12.6%	41.0%
Denmark	30.0% (↑)	40.0%	32.6%	32.0%	25.3%	40.1%
Finland	15.2%	53.2%	14.5%	14.6%	16.0%	40.1%
France	17.1%	25.3% (↓)	20.7%	21.0%	13.5%	23.2%
Germany	16.9%	33.5%	19.3%	18.0%	14.6%	28.1%
Greece	12.6%	46.4%	27.7%	16.0%	5.0%(↓)	34.7%
Ireland	36.0% (↑)	55.4%	42.5%	37.4%	39.4%(↑)	62.2% (↑)
Israel	18.0%	63.2% (↑)	24.0%	24.8%	12.1%	51.4%
Italy	15.4%	34.5%	19.3%	15.0%	11.6%	29.3%
Japan	6.1% (↓)	39.5%	3.7% (↓)	8.5%(↓)	3.7%(↓)	37.0%
Kazakhstan	37.1% (↑)	47.0%	46.0%	22.8%	23.1%	30.5%
Kyrgyzstan	0.0% (↓)	56.3%	28.1%	42.3%(↑)	14.1%	42.3%
Latvia	11.7%	67.2% (↑)	27.6%	11.9%	7.1%	44.5%
Luxembourg	16.6%	64.6% (↑)	7.1% (↓)	11.5%(↓)	9.4%	46.0%
Mexico	23.5%	37.7%	39.8%	27.5%	19.3%	34.3%
Netherlands	29.0%	49.4%	44.7%	33.1%	31.3%(↑)	43.3%
Panama	22.6%	41.0%	38.6%	39.7%(↑)	11.2%	34.8%
Peru	24.4%	48.1%	47.7%	36.1%	13.8%	47.2% (↑)
Poland	17.8%	42.2%	36.8%	27.4%	16.0%	37.8%
Portugal	16.0%	52.3%	14.8%	16.8%	17.1%	32.4%
Serbia	13.8%	30.2%	45.6%	18.0%	5.4%	20.8% (↓)
Slovenia	13.9%	42.8%	29.3%	13.3%	10.3%	35.3%
Spain	23.1%	43.5%	23.3%	23.7%	20.8%	37.9%
Sweden	27.5%	50.8%	35.0%	27.1%	25.7%	44.1%
Switzerland	18.3%	30.7%	20.4%	19.5%	15.3%	24.3%
Thailand	25.4%	34.2%	52.1% (↑)	33.2%	32.8%(↑)	33.4%
Türkiye	12.3%	26.2%	29.7%	18.6%	12.0%	26.0%
United Kingdom	24.5%	26.4%	29.3%	23.1%	25.8%	25.1%
United States	17.1%	22.5% (↓)	22.4%	20.1%	20.4%	22.2%
Uzbekistan	28.2%	48.7%	49.2% (↑)	42.4%(↑)	28.1%	45.5%
Europe22	19.4%	35.1%	24.5%	20.7%	17.1%	30.3%
America8	17.7%	30.1%	26.2%	22.8%	18.5%	26.6%
AsiaOceania6*	18.9%	31.8%	37.7%	24.9%	22.7%	30.4%

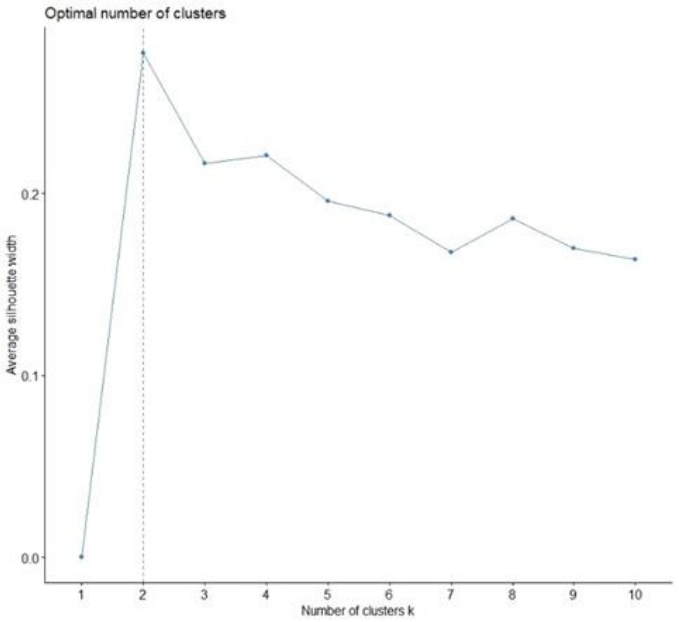
Note: (↑) indicates the three highest safety perception scores while (↓) the lowest three.

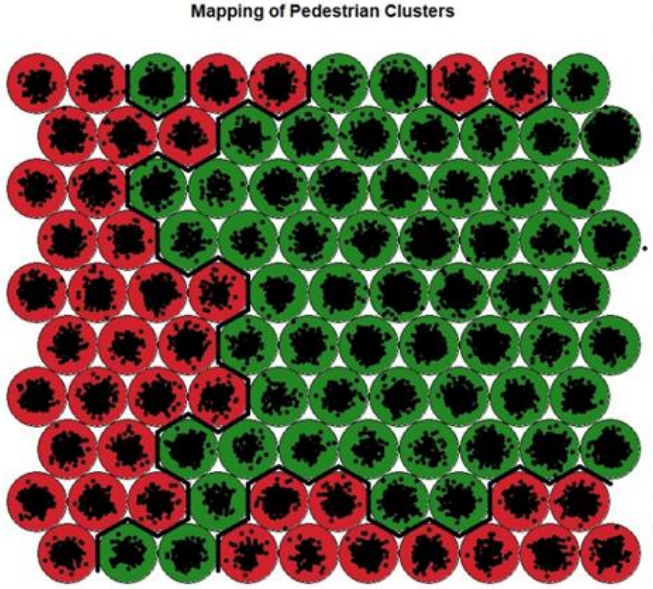
- The percentage of moped riders and motorcyclists who admit to **drinking and riding** in the past 30 days varies for the majority of the countries from 15% to 25%.
- In most participating countries worldwide, almost half of the moped riders and motorcyclists admit to **speeding outside built-up areas** (not on motorways/freeways) in the past 30 days.
- In most countries, the percentage of moped riders and motorcyclists who admit to **riding without a helmet** in the past 30 days varies from 20% to 40%.
- The percentage of moped riders and motorcyclists who admit to **reading a text message/email or checking social media while riding** varies from 20.7% in Europe to 24.9% in Asia-Oceania.
- **Riding within 1 hour after taking drugs** (other than prescribed or over the counter medication) varies from 17.1% in Europe to 22.7% in Asia-Oceania.
- The percentage of **riding too fast for the road/traffic conditions** at the time varies from 26.6% in America to 30.3% in Europe and Asia-Oceania.

Pedestrians' Self-Organised Map (SOM)



- **Higher** degrees of unsafe behaviors are found towards the leftmost and bottom rows of the grid, with some possible discontinuity between them.
- Results indicate that the optimal number of clusters for pedestrians is **two:**
- **Green** cluster (21894 observations): Low-risk pedestrians
- **Red** cluster (9635 observations): High-risk pedestrians





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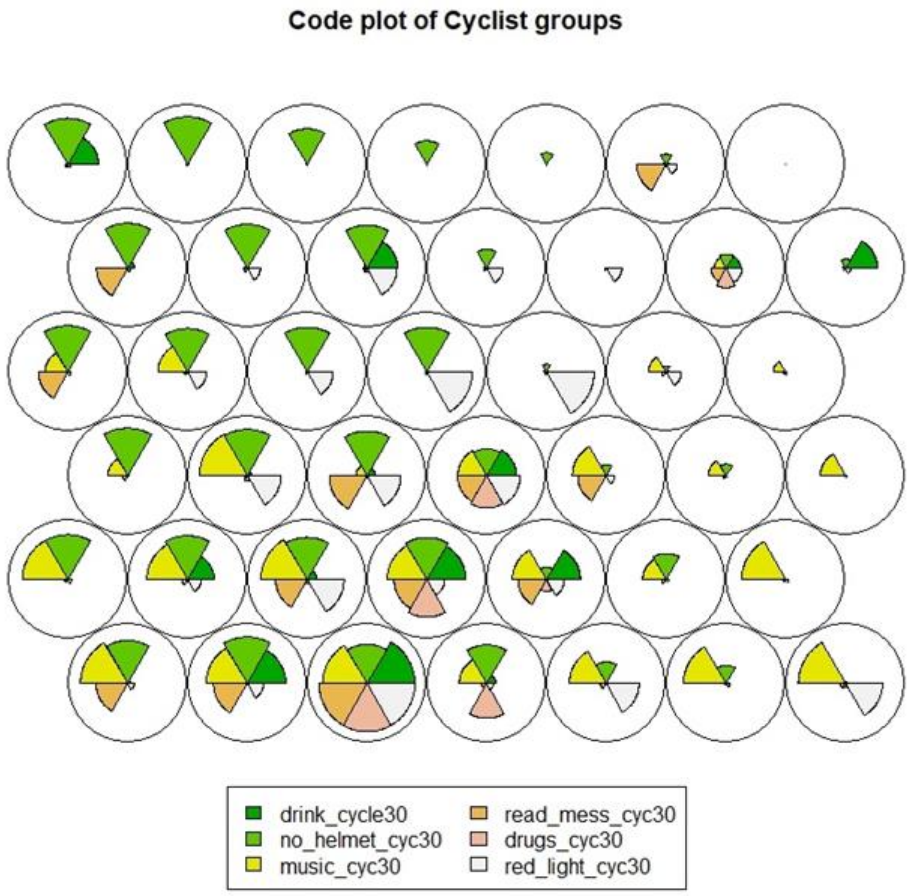
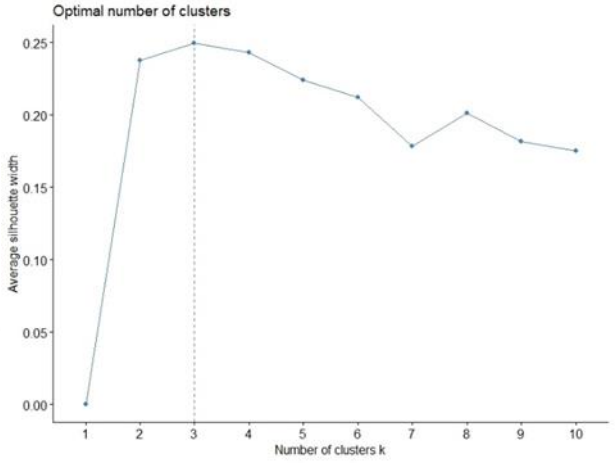
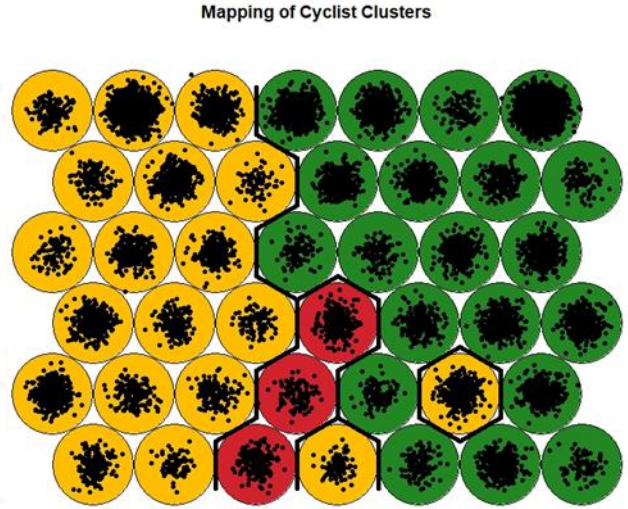
Cyclists' Self-Organised Map (SOM)



- **Gradual** phasing out of unsafe behaviors from the bottom left side towards the upper right side of the code plot, while the unsafe behavior of not using a helmet being present throughout the left side of the plot.
- It is evident that the optimal number is **three** clusters for cyclists:
- **Green** cluster (9638 observations): Low-risk cyclists
- **Yellow** cluster (5996 observations): Modestly risky cyclists
- **Red** cluster (558 observations): High-risk cyclists





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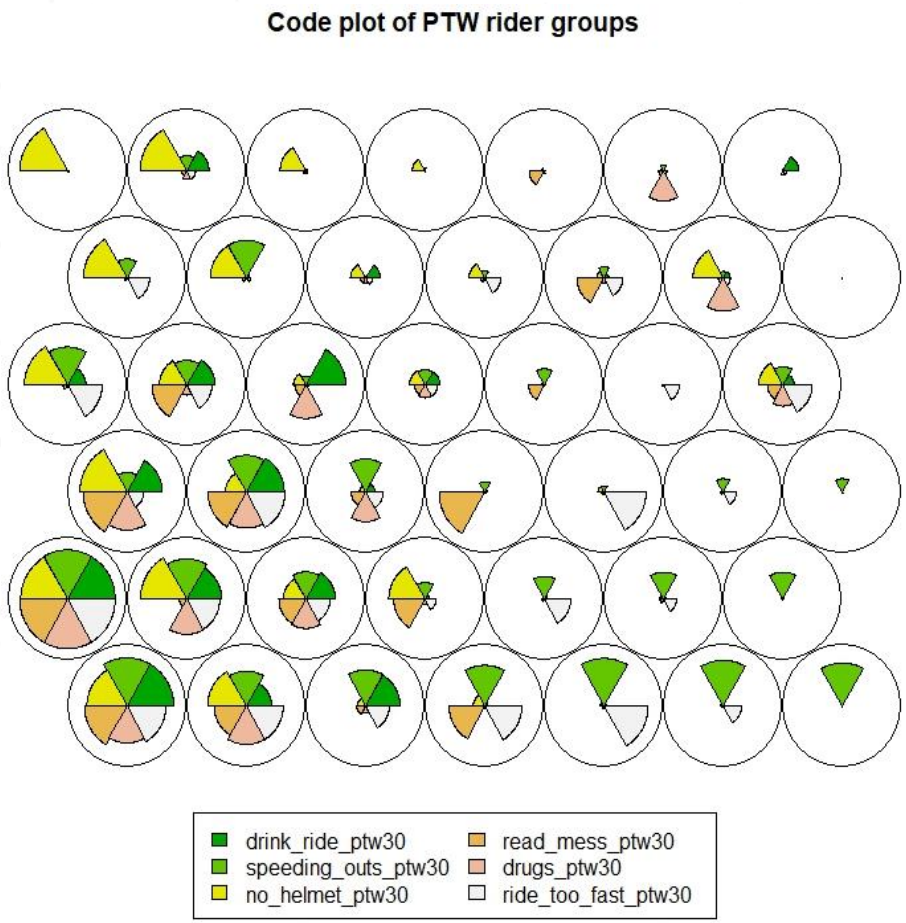
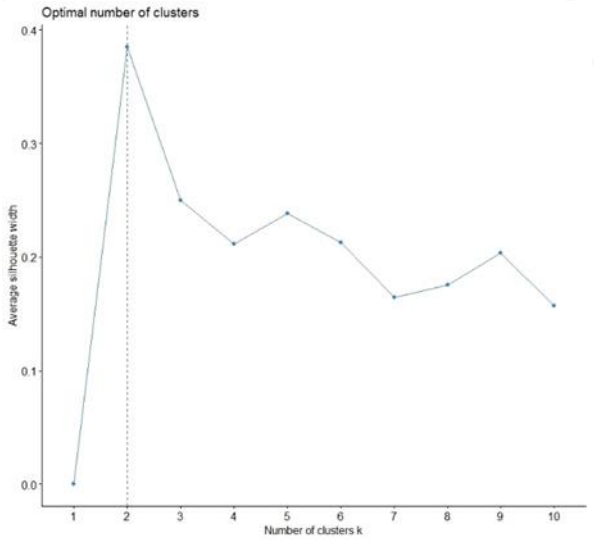
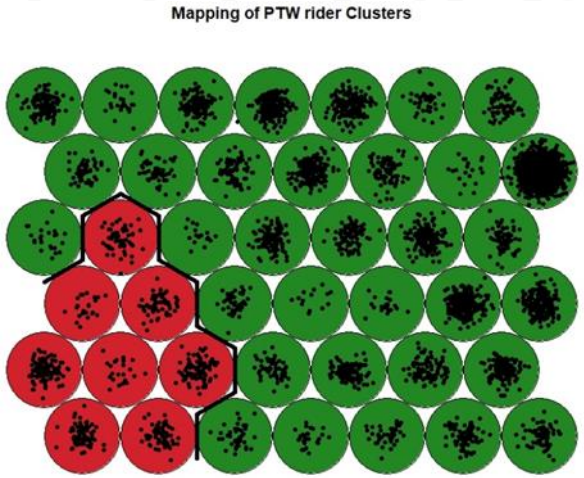
Moped riders and motorcyclists' Self-Organised Map (SOM)



- Similar to the analysis for cyclists, the weights reveal that **higher** levels of unsafe behaviors among PTW riders are concentrated in the leftmost and bottom rows of the grid, with some potential discontinuities between these areas.
- This analysis indicates that **two** clusters are the optimal number for PTW riders:
- **Green** cluster (5544 observations): Low-risk PTW riders
- **Red** cluster (494 observations): High-risk PTW riders





SOM results

Cluster designation	Ages 18-34	%	Ages 35-54	%	Ages 55-74	%	Total	%
Cluster 1 - Low Risk	5424	17.20%	8771	27.82%	7699	24.42%	**21894**	**69.44%**
Cluster 2 - High Risk	4961	15.73%	3656	11.60%	1018	3.23%	**9635**	**30.56%**
Total	**10385**	**32.94%**	**12427**	**39.41%**	**8717**	**27.65%**	**31529**	**100.00%**

- Approximately 69% of participants are low-risk **pedestrians**, while about 31% are high-risk pedestrians based on exhibited behavior.

Cluster designation	Ages 18-34	%	Ages 35-54	%	Ages 55-74	%	Total	%
Green Cluster - Low Risk	3354	20.71%	4064	25.10%	2220	13.71%	**9638**	**59.52%**
Yellow Cluster - Moderate Risk	2185	13.49%	2325	14.36%	1486	9.18%	**5996**	**37.03%**
Red Cluster - High Risk	306	1.89%	215	1.33%	37	0.23%	**558**	**3.45%**
Total	**5845**	**36.10%**	**6604**	**40.79%**	**3743**	**23.12%**	**16192**	**100.00%**

- Approximately 60% of cyclists are low-risk riders, about 37% of **cyclists** are moderate risk takers, while 3% of cyclists are high-risk riders.

Cluster designation	Ages 18-34	%	Ages 35-54	%	Ages 55-74	%	Total	%
Cluster 1 - Low Risk	2495	41.32%	2239	37.08%	810	13.42%	**5544**	**91.82%**
Cluster 2 - High Risk	267	4.42%	198	3.28%	29	0.48%	**494**	**8.18%**
Total	**2762**	**45.74%**	**2437**	**40.36%**	**839**	**13.90%**	**6038**	**100.00%**

- Approximately 92% of participants are classified as low-risk **PTW riders**, while around 8% are categorized as high-risk based on their exhibited behaviors.

Conclusions

- **Pedestrians** in European countries generally feel safer than those in other regions, while cyclists in some countries do not wear their helmet use.
- **Moped riders and motorcyclists'** safety perceptions also vary significantly across regions, with notable differences in risky behaviors such as crossing roads at red lights, riding without helmets, and speeding.
- **Drug and alcohol** consumption while riding is reported in some regions at heightened levels, particularly among cyclists and moped riders.
- The **Self-Organizing Maps (SOM)** analysis categorizes VRUs into low-risk, moderate-risk, and high-risk clusters, with older individuals generally displaying fewer risky behaviors.

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Eva Michelaraki

Senior Research Engineer, National Technical University of Athens

evamich@mail.ntua.gr