Socio-cognitive factors in road safety monitoring

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Université Gustave Eiffel

ESRA
www.esranet.eu
E-Survey of Road users' Attitudes

Uta Meesmann

Master degrees in Public Health (2003) and European Public Health, Germany (2004)

Experience in road safety monitoring, DUI, survey research

Senior Researcher at Vias institute, Belgium (since 2007)

Scientific Coordinator of the research line Achieving behavioural change (since 2015)

Project Manager of ESRA (since 2015)

Socio-cognitive factors in road safety monitoring

Background

Survey research in road safety monitoring

Socio-cognitive concepts

Methodology

EFA

Component scores

Linear regression

Results

Linear regression models

Conclusions

Socio-cognitive factors

Background

Survey research in road safety monitoring (e.g., Belgium)

Accident statistics

Observations

Risk

KPI

Roadside surveys

Observed behaviour

Risk

KPI

Survey research (ESRA)

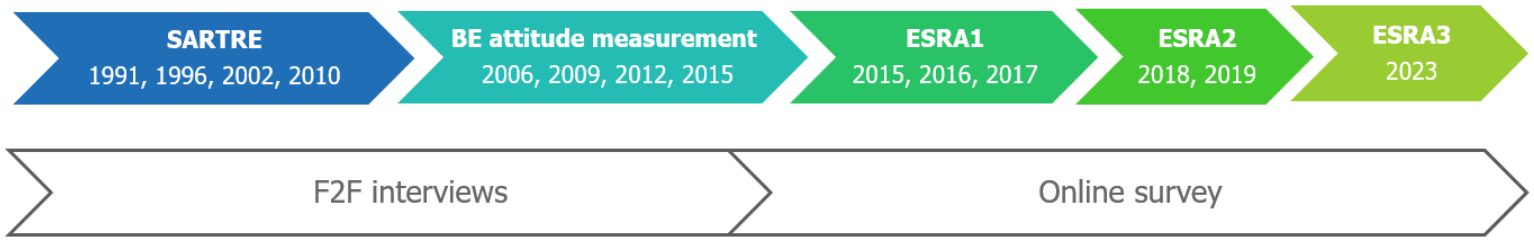
Self-declared behaviour

Key advantages:

Sociodemographic information
Motivational factors

Large dataset
International comparable data

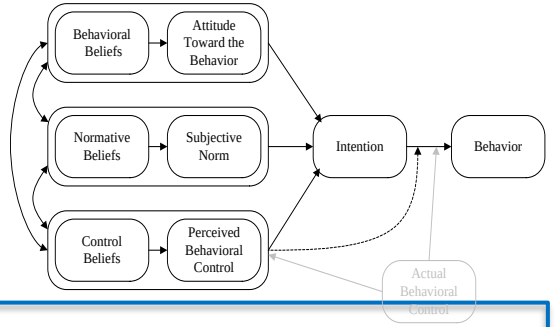
Relatively inexpensive and fast (online surveys)



Socio-cognitive concepts in ESRA2 survey

- Sociodemographic variables & exposure
- Attitudes
- Norms
- Perceived behaviour control
- Intention
- Risk perception
- Social desirability

→ Self-declared behaviour



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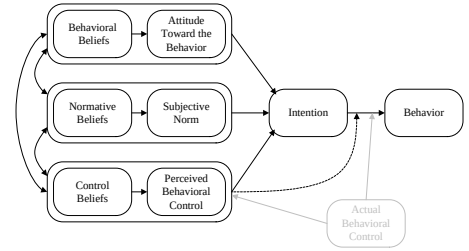

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Self-declared behaviour

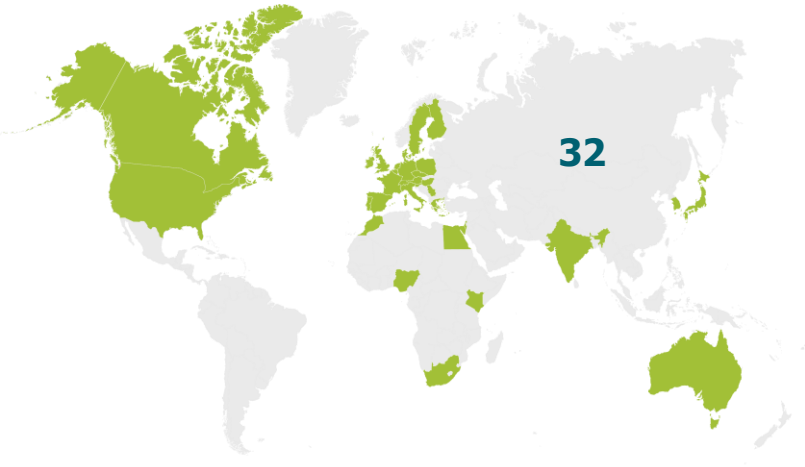
- DUI
- Mobile phone use
- Speeding

Models

- Overall model
- National models

Methodology

Methodology – in a nutshell



- Aim: assess relation between socio-cognitive factors and self reported unsafe traffic behaviour in a cross-national perspective
- Data sources: ESRA2_2018 data (32 countries) = online panel survey
- Same data cleaning, weighting and data processing as in ESRA2
- Sample: N = 25,459 car drivers (at least a few days a month)
- Focus on:
  - Cross topic comparison: DUI, mobile phone use, speeding
  - Cross national comparison
- Analytical methods applied:
  - Explorative factor analysis (EFA) to extract component scores
  - Linear regression models per road safety topic (3x1 overall models and 3x32 national models)

Explorative factor analysis (EFA) based on total sample to define the factor structure

Concepts expanded to other road safety topics

- Attitudes
- Intention
- Risk perception
- Social desirability

Concepts specific per road safety topics

- Norms
- Perceived behaviour control
- Self-declared behaviour

Investigated road safety topics: DUI, mobile phone use, speeding
Sample: ESRA2-2018 data from 32 countries; N= 25,459 car drivers

Extraction of component scores: for the total sample and for each country separately

Table 3. Allocation of ESRA2 variables to underlying (socio-cognitive) constructs, and their component scores

Construct	ESRA2 variable	Overall model Loading
Dependent variable		
Self-reported mobile phone use[1]	*Over the last 30 days, how often did you as a CAR DRIVER ...*	
	- talk on a hand-held mobile phone while driving?	0.828
	- talk on a hands-free mobile phone while driving?	0.671
	- read a text message/email or check social media (e.g. Facebook, twitter, etc.) while driving?	0.822
TPB constructs		
Attitudes[2,3]	*To what extent do you agree with each of the following statements?*	
	- For short trips, one can risk driving under the influence of alcohol.	0.512
	- I have to drive fast; otherwise, I have the impression of losing time.	0.701
	- Respecting speed limits is boring or dull.	0.545
	- For short trips, it is not really necessary to use the appropriate child restraint.	0.496
	- I use a mobile phone while driving, because I always want to be available.	0.733
	- To save time, I often use a mobile phone while driving.	0.756
Norms[4]	*Where you live, how acceptable would most other people say it is for a car driver ...*	
	- to talk on a hand-held mobile phone while driving?	0.802
	- to read a text message/email or check social media (e.g. Facebook, twitter, etc.) while driving?	0.779
	How acceptable do you, personally, feel it is for a CAR DRIVER to drive ...	
	- to talk on a hand-held mobile phone while driving?	0.793
	- to talk on a hand-free mobile phone while driving?	0.454
	- to read a text message/email or check social media (e.g. Facebook, twitter, etc.) while driving?	0.780
PBC[3]	*To what extent do you agree with each of the following statements?*	
	- I trust myself when I check my messages on the mobile phone while driving.	0.851
	- I have the ability to write a message on the mobile phone while driving.	0.858
	- I am able to talk on a hand-held mobile phone while driving.	0.804
Intention[2,3]	*To what extent do you agree with each of the following statements?*	
	- I will do my best not to drive after drinking alcohol in the next 30 days.	0.745
	- I will do my best to respect speed limits in the next 30 days.	0.766
	- I will do my best not to use my mobile phone while driving in the next 30 days.	0.790

Extraction of component scores: for the total sample and for each country separately

Table. Allocation of ESRA2 variables to underlying (socio-cognitive) constructs, and their component scores

Construct	ESRA2 variable	Overall model Loading
Additional constructs		
Risk perception[2,5]	How often do you think each of the following factors is the cause of a road crash involving a car?	
	- driving after drinking alcohol	0.913
	- driving after taking drugs (other than medication)	0.891
	- driving faster than the speed limit	0.814
	- using a hand-held mobile phone while driving	0.868
	- inattentiveness or day-dreaming while driving	0.857
	- driving while tired	0.876
SDR[6]	To what extent are the following statements true?	
	- I always respect the highway code, even if the risk of getting caught is very low.	0.804
	- I would still respect speed limits at all times, even if there were no police checks.	0.772
	- I have never driven through a traffic light that had just turned red.	0.623
	- I do not care what other drivers think about me.	0.356
	- I always remain calm and rational in traffic.	0.720
	- I am always confident of how to react in traffic situations.	0.597

Loading: factor (principal component) loading

[1] *answered on a 5-point scale ranging from 1 'never to 5 '(almost) always*

[2] *expanded to other road safety topics(e.g., speeding, mobile phone us, seat belt use)*

[3] *answered on a 5-point scale ranging from 1 'disagree' to 5 'agree'*

[4] *answered on a* 5-point scale ranging from 1 'unacceptable' to 5 'acceptable'

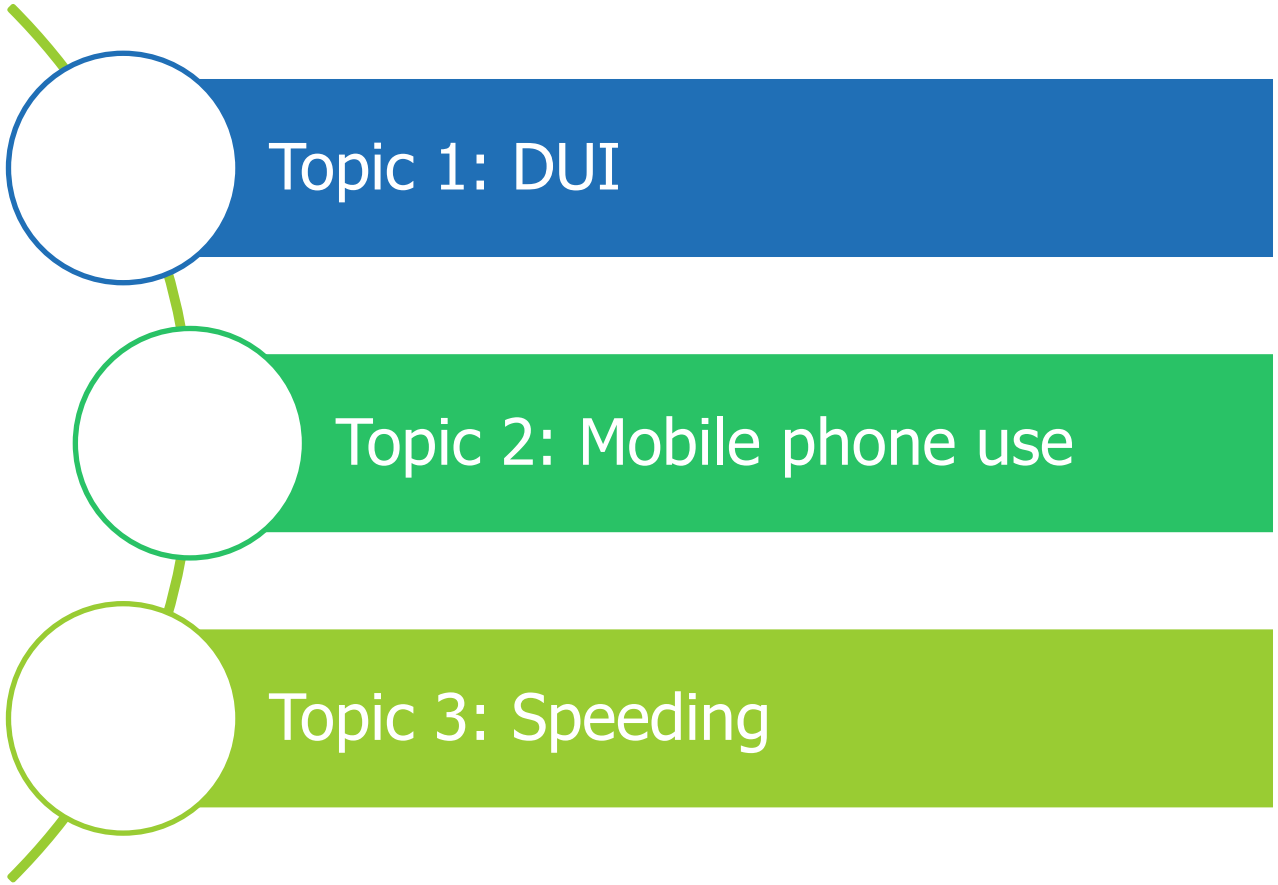
[5] *answered on a 6-point scale ranging from 1 'never' to 6 '(almost) always'*

[6] *answered on a 5-point scale ranging from 1 'very untrue' to 5 'very true'*

Linear regression models

Models per road safety topic

- 1 overall model
- 32 national models



Linear regression models per road safety topic (3x1 overall models and 3x32 national models)
Sample: ESRA2-2018 data from 32 countries; N= 25,459 car drivers

Results of linear regression

Linear regression models – overall models

Table. Parameter estimates linear regression model predicting self-declared unsafe traffic behaviour – overall models including 32 countries (only significant effect are presented)

Parameter (reference category)	DUI Estimate	Mobile phone use Estimate	Speeding Estimate
Intercept	-0.022	-0.232	-0.204
Socio-demographic variables & exposure			
Gender (Female)			
Male	0.024	---	0.064
Age (55+)			
35-54	-0.056	0.120	-0.052
18-34	-0.052	0.133	-0.094
Education (≥ Bachelor)			
≤ Secondary education	---	-0.042	0.044
Access to public transport (frequent)			
Not frequent	0.008	---	0.044
Driving frequency (A few days a month)			
1 to 3 days a week	---	0.036	0.094
At least 4 days a week	---	0.214	0.240
TPB constructs			
Attitudes[1]	0.173	0.271	0.153
Norms	0.320	0.181	0.412
PBC	0.326	0.339	0.179
Intention[1]	-0.033	---	---
Additional constructs			
Risk perception[1]	---	0.051	0.056
SDR	---	-0.029	-0.189
Model Fit			
R^2	0.43	0.49	0.52

[1] *expanded to other road safety topics(e.g. speeding, mobile phone us, seat belt use)*
--- included in the model but not significant (p>.05).

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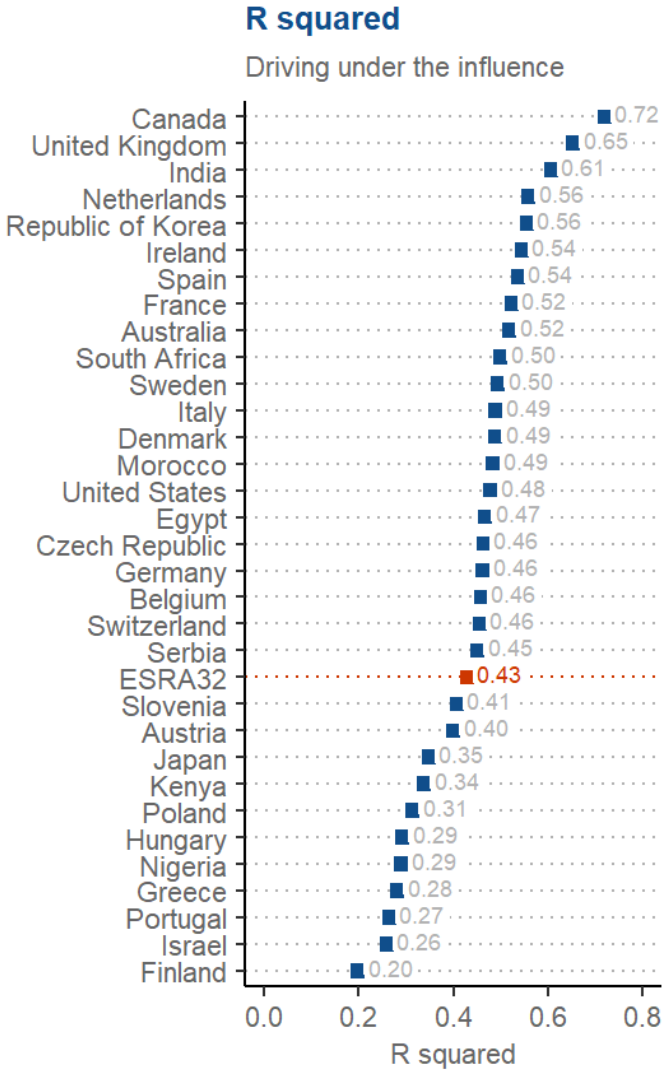

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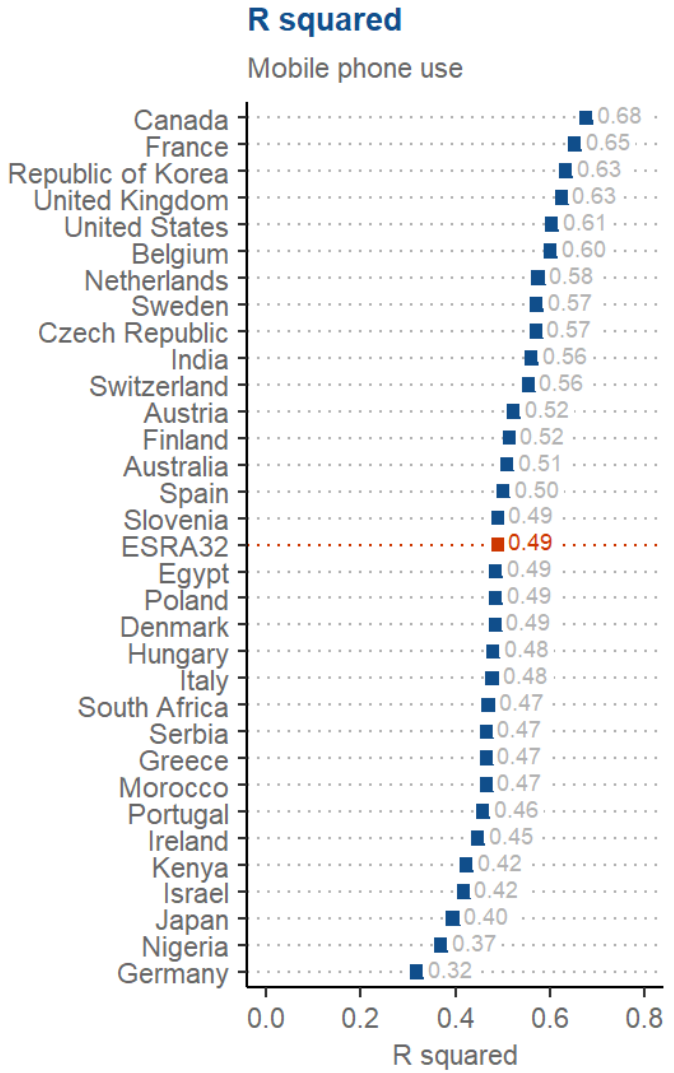

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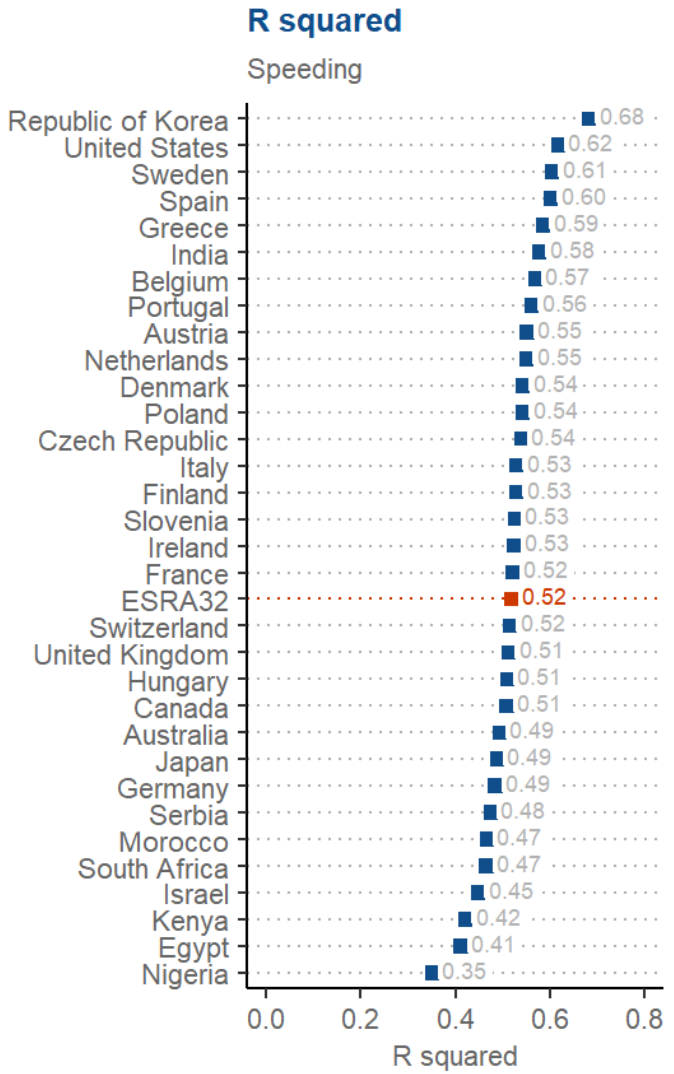

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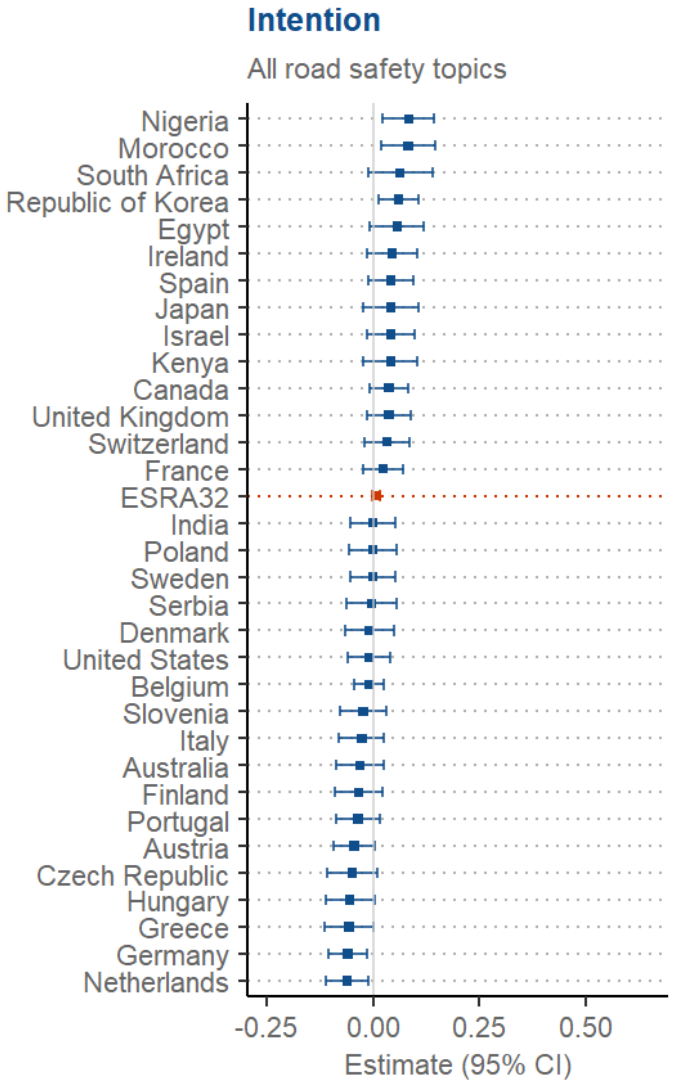

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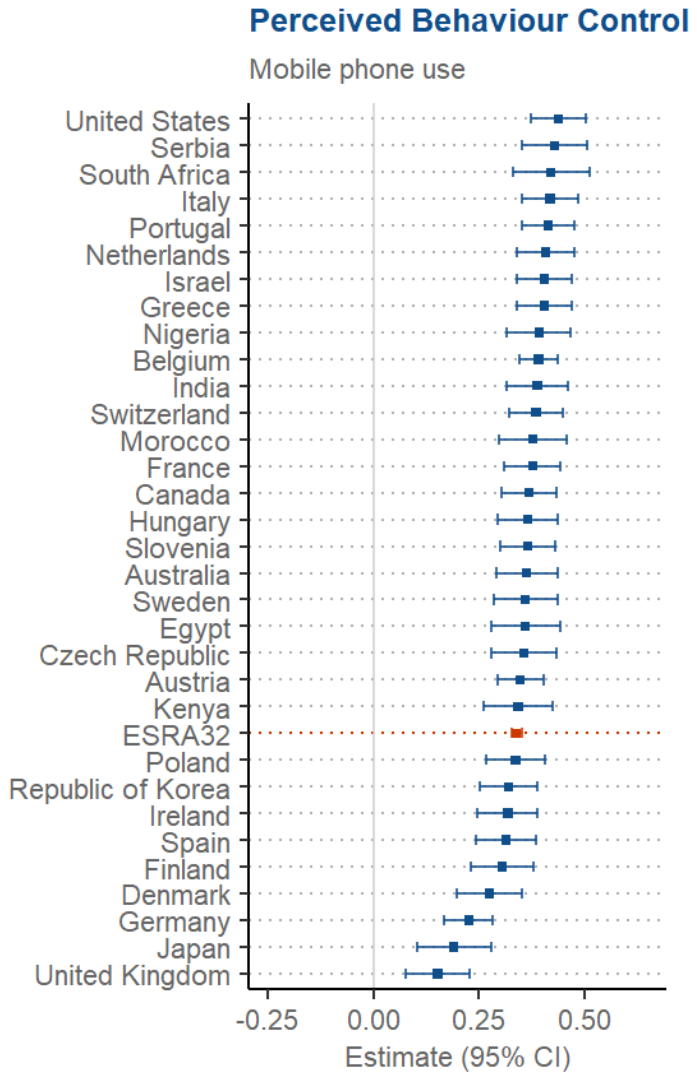

Linear regression models – mobile phone use

Table. Parameter estimates linear regression model predicting self-declared mobile phone use while driving (only significant effect are presented)

Parameter (reference category)	32 countries Estimate	Australia Estimate	Belgium Estimate	Canada Estimate	Egypt Estimate	Japan Estimate	Nigeria Estimate	Slovenia Estimate
Intercept	-0.232	-0.156	-0.221	-0.062	-0.261	-0.123	-0.690	-0.498
Socio-demographic variables & exposure								
Gender (Female)								
Male	---	-0.106	---	---	---	---	0.148	---
Age (55+)								
35-54	0.120	---	0.136	---	---	---	0.274	0.225
18-34	0.133	---	0.109	---	---	0.099	0.294	0.162
Education (≥ Bachelor)								
≤ Secondary education	-0.042	---	---	---	---	---	---	---
Access to public transport (frequent)								
Not frequent	---	---	-0.093	---	---	---	---	---
Driving frequency (A few days a month)								
1 to 3 days a week	0.036	---	---	---	---	---	0.332	---
At least 4 days a week	0.214	---	0.299	---	0.257	0.261	0.352	0.340
TPB constructs								
Attitudes[1]	0.271	0.280	0.280	0.404	0.269	0.268	0.124	0.163
Norms	0.181	0.132	0.175	0.141	0.164	0.269	0.178	0.158
PBC	0.339	0.364	0.392	0.370	0.361	0.192	0.393	0.366
Intention[1]	---	---	---	---	---	---	0.084	---
Additional constructs								
Risk perception[1]	0.051	0.086	0.049	---	0.081	---	---	---
SDR	-0.029	-0.079	---	---	-0.072	---	-0.121	-0.112
Model Fit								
R^2	0.49	0.51	0.60	0.68	0.49	0.40	0.37	0.49

[1] *expanded to other road safety topics(e.g. speeding, mobile phone us, seat belt use)*

--- included in the model but not significant (p>.05).

Conclusion

Conclusions from the linear regression models

- Socio-cognitive factors, as applied in the ESRA2 survey, can be used to predict self-declared unsafe traffic behaviour:
  - R^2 in the overall model: DUI 0.43 mobile phone use 0.49 speeding 0.52
  - R^2 in national models: DUI 0.2-0.72 mobile phone use 0.32-0.68 speeding 0.35-0.68
- The relation of socio-cognitive factors on self-declared unsafe traffic behaviour differs across countries and road safety topic.
- In a next step the analysis will focus on clustering the countries based to the effect sizes in the regression models.

Conclusions on socio-cognitive factors in road safety monitoring

- Socio-cognitive factors can help to understand the motivations for unsafe traffic behaviour.

- They can provide guidance for the development of counter measures (i.e., sensibilization measures)

  For example:

  - National regression models can indicate the most relevant topics for sensibilization campaigns.
  - Socio-cognitive factors can be used for pre-post measuring to evaluate campaigns.
  - Experiences in Belgium have shown that socio-cognitive factors are more sensitive to change than the self-declared behaviour itself.

- Changes in road safety culture can be assessed by including socio-cognitive factors in road safety monitoring.

Conclusions on socio-cognitive factors in ESRA

- The ESRA data provide a standard set of socio-cognitive factors which can be used as indicators in global road safety monitoring.
- This ESRA set of socio-cognitive factors/indicators enables comparisons across different countries and road safety topics.
- The aim is to keep a core set of these variables in every ESRA edition and to develop time series on socio-cognitive road safety indicators.

Thank you very much for your attention!

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