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New challenges to traffic safety: Focus on personal prevention

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Road deaths per million inhabitants in the European countries in 2017

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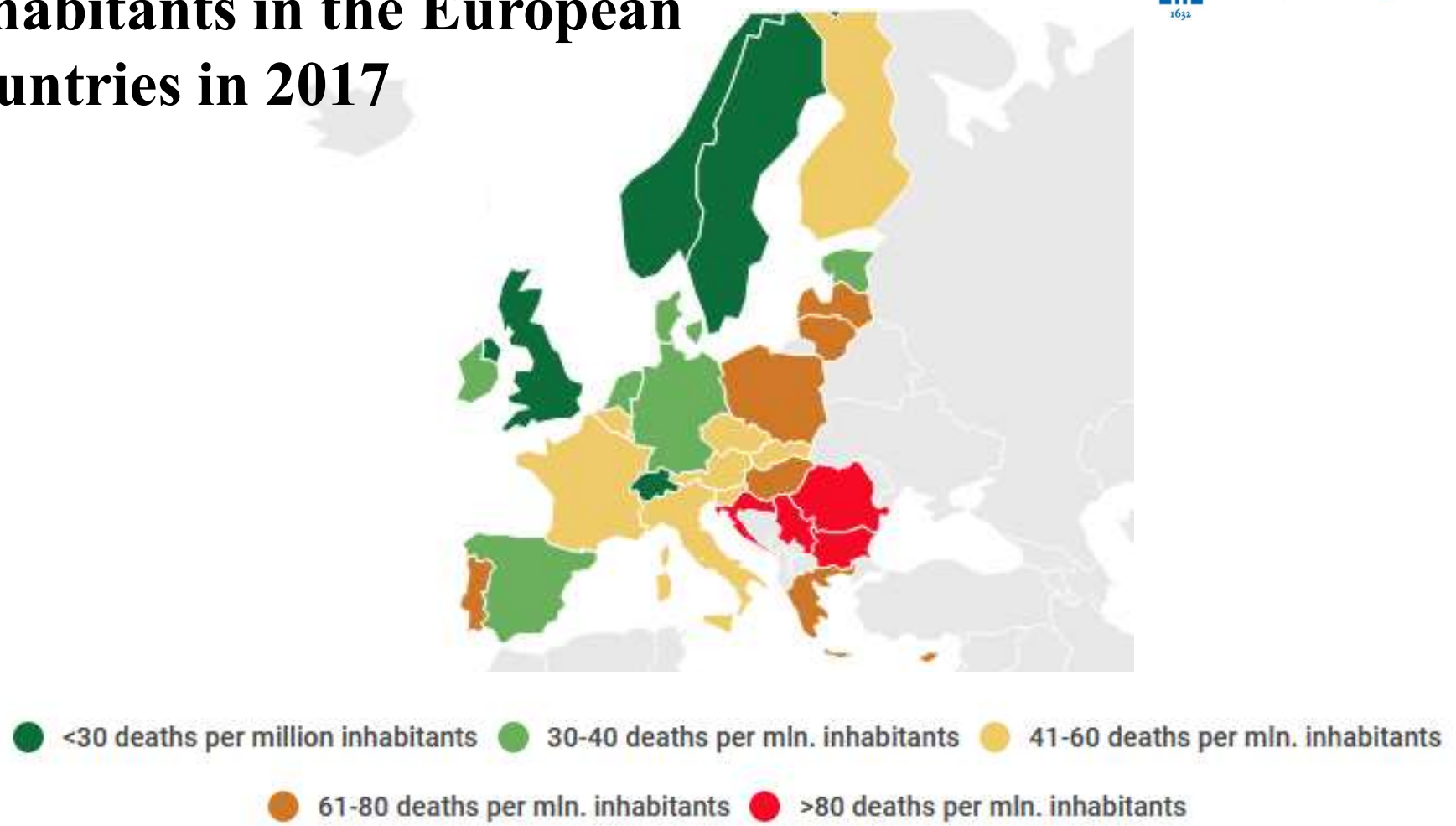

ETSC 2018. 12th Road Safety Performance Index Report

European Union road safety target and progress

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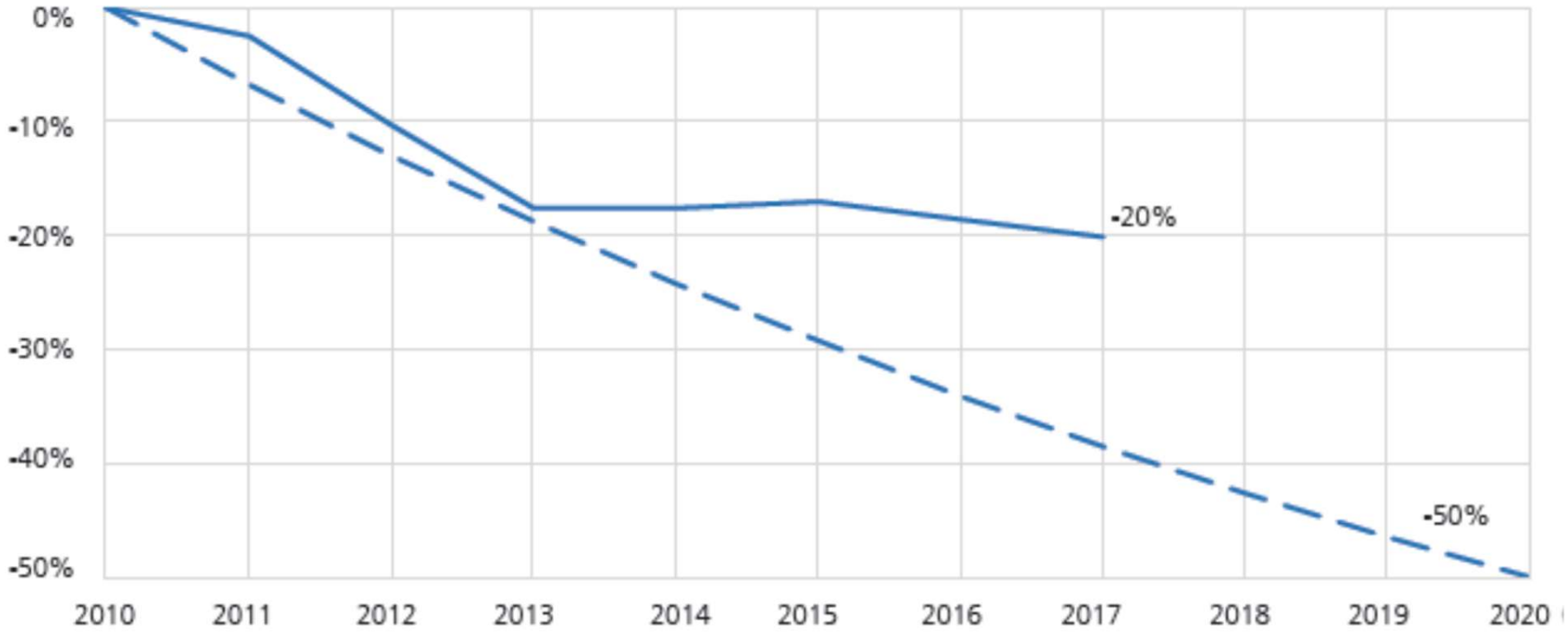

ETSC 2018. 12th Road Safety Performance Index Report

Relative change (%) in road deaths between 2016 and 2017 in European countries

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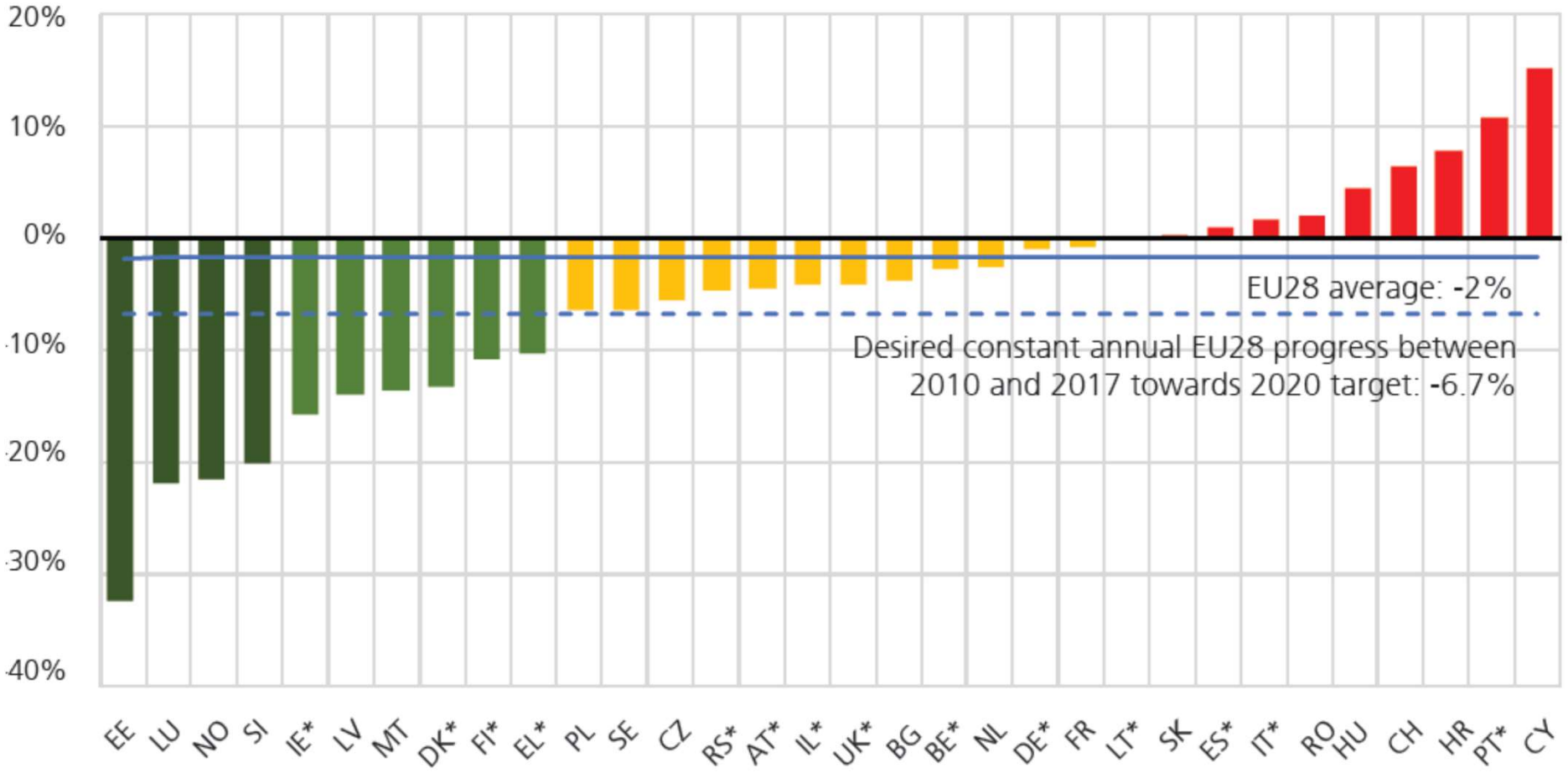

ETSC 2018. 12th Road Safety Performance Index Report

Introduction

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- The majority of the traffic accidents are associated with risky driving behaviour that is especially common among young novice drivers.
- Risky behaviour, including risky traffic behaviour, is associated with high impulsivity.
- Impulsivity related behaviours are associated with biological differences, especially serotonergic and dopaminergic functioning in the brain.
- Allelic variations in genes such as serotonin transporter gene (5-HTTLPR) and dopamine transporter gene (*DAT1* VNTR) mediate respectively dopaminergic and serotonergic functioning in the brain.
- Behaviour = environment x genotypes

The aim

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- To show effectiveness of two intervention studies carried out in driving schools.

- To clarify how impulsivity-related allelic variations in genes such as dopamine transporter gene (*DAT1* VNTR) and serotonin transporter gene (5-HTTLPR) are associated with traffic behaviour and intervention.

- To argue how obtained knowledges could be use to achieve road safety targets along with other actions.

The samples

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Study 1*, from 2007 4.5 years

		Intervention group	Controls	"Lost" group	Total
Male	n	439	239	128	806
Female	n	619	278	163	1060
Total	n	**1058**	**517**	**291**	**1866**
		Intervention	No intervention		

mean age:
23.0 (SD=7.3) years

767 blood samples

Study 2#, from 2014 3 years

		Intervention group	Controls	Total
Male	n	321	303	624
Female	n	416	401	817
Total	n	**737**	**704**	**1441**

mean age:
22.5 (SD=7.9) years

1341 saliva samples

* Paaver et al., 2013; Eensoo et al., 2018; # Luht et al. submitted

Methods (I)

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- The intervention „Reducing Impulsive Action in Traffic“

  Passive learning method (lecture 45’)
  - tips for self-monitoring
  - personal risks
  - results of studies

  Active learning method (group work with discussions 45’).
  - role of personality and cognitive factors in different traffic collisions

- **Study 1**: the intervention was carried out by a psychologist
- **Study 2**: driving school teachers were specially trained (2 ECTS) to carry out the intervention.

Methods (II)

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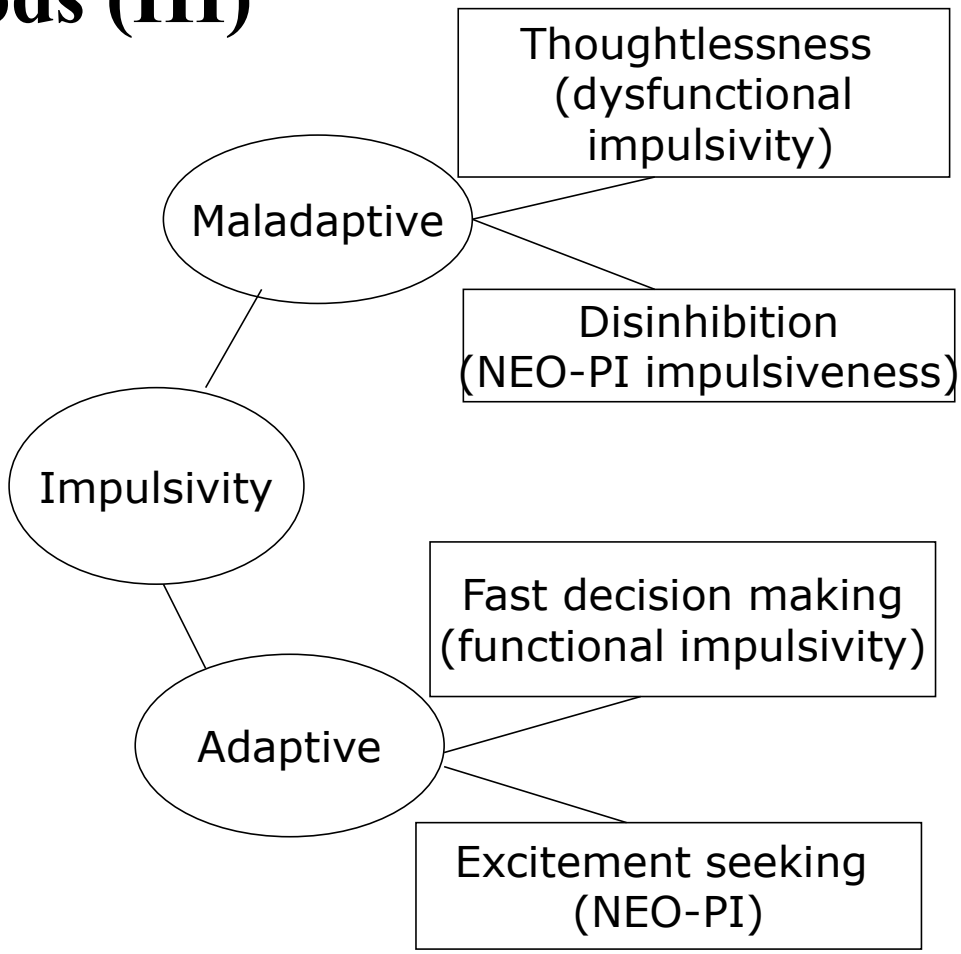
Main ideas and aims of the intervention

Impulsivity awareness	To help students to spot and acknowledge impulsive tendencies both in themselves and in others.
Self-monitoring	To guide students to monitor personal risk proneness and notice situations that are dangerous specifically to them because of their personal features.
Self-regulation	To teach students the general cognitive-behavioral idea that behavior can be changed because we can choose what we think.

Methods (III)



Cognitive tendency to decide and act without forethought and/or analysing the consequences

Personality tendency to give up to one's maladaptive wishes and moods; problems in inhibiting one's desires and delaying reward

Cognitive tendency to decide and act fast in situations, where this is necessary

Tendency to search for change and activities that may involve risk

Adaptive and Maladaptive Impulsivity Scale (AMIS, Eensoo et al., 2007)

Methods (IV)

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- 5-HTTLPR (s' carriers vs l'/l') and *DAT1* VNTR (9R carriers vs 10R/10R) were genotyped

- Traffic insurance and police databases
  - Traffic collisions (active and passive)
  - Speed limit exceeding
  - Drunk driving
  - Other violations
  - General traffic risk (occurrence of either recorded traffic offence or a collision)

Study 1:

Incidents in traffic during 4.5 year study period

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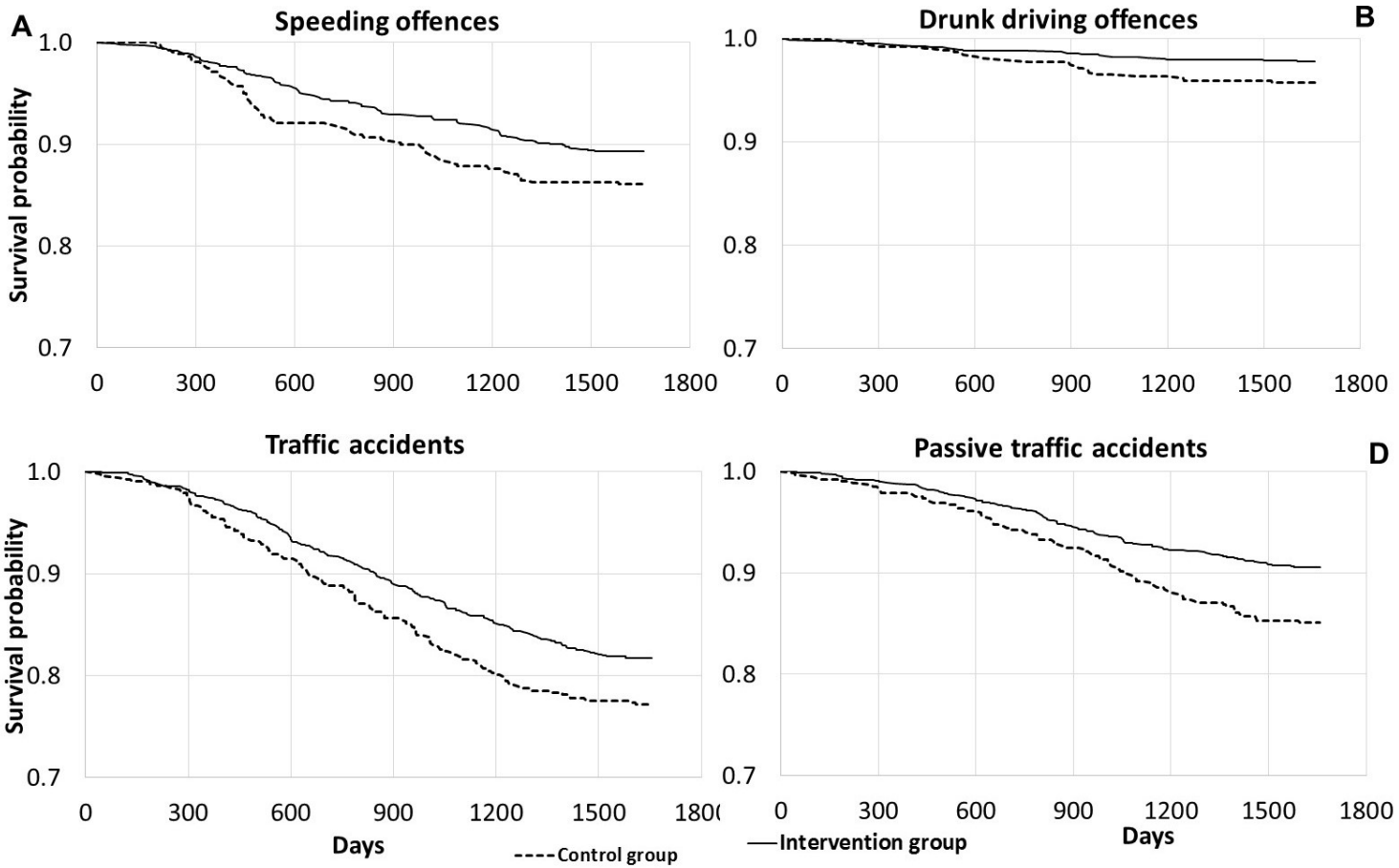
4.5 years: p=0.052
4 years: p=0.0018



4.5 years: p=0.026

4.5 years: p=0.0018

4.5 years: p=0.0008

Study 1: Impulsivity measures predicting incidents in traffic by univariate Cox regression

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	Speed limit exceeding HR (95% CI)	Drunk driving HR (95% CI)	Traffic collisions HR (95% CI)	Passive traffic collisions HR (95% CI)
Excitement seeking	**1.11 (1.08-1.15)**	**1.09 (1.02-1.16)**	**1.03 (1.01-1.05)**	**1.05 (1.02-1.08)**
Fast decision-making	**1.08 (1.04-1.12)**	1.07 (1.00-1.15)	1.03 (1.00-1.05)	**1.04 (1.01-1.08)**
Disinhibition	1.01 (0.97-1.04)	1.06 (0.99-1.14)	0.99 (0.97-1.02)	1.00 (0.96-1.04)
Thoughtlessness	1.03 (1.00-1.06)	**1.07 (1.01-1.14)**	0.99 (0.97-1.02)	1.00 (0.97-1.03)

Study 1: Incidents in traffic by gender, participation in the intervention and 5-HTTLPR

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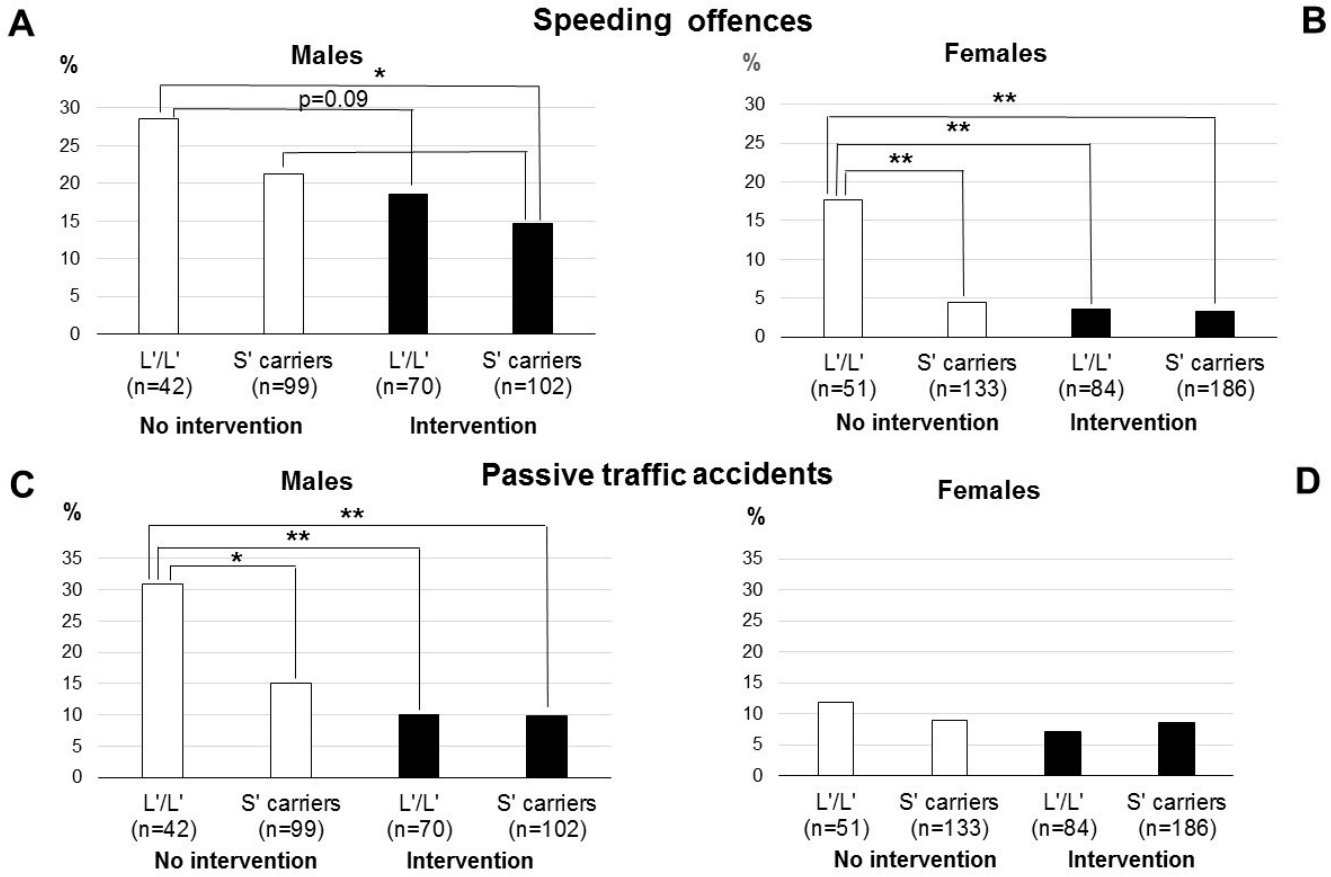
	Speeding offences OR (95% CI)	Traffic collisions OR (95% CI)
5-HTTLPR S' carriers vs L'/L'	**0.58 (0.37-0.91)**	**0.69 (0.48-0.99)**



*p < 0.05, **p < 0.01, significant difference

Study 2: High **general traffic risk**

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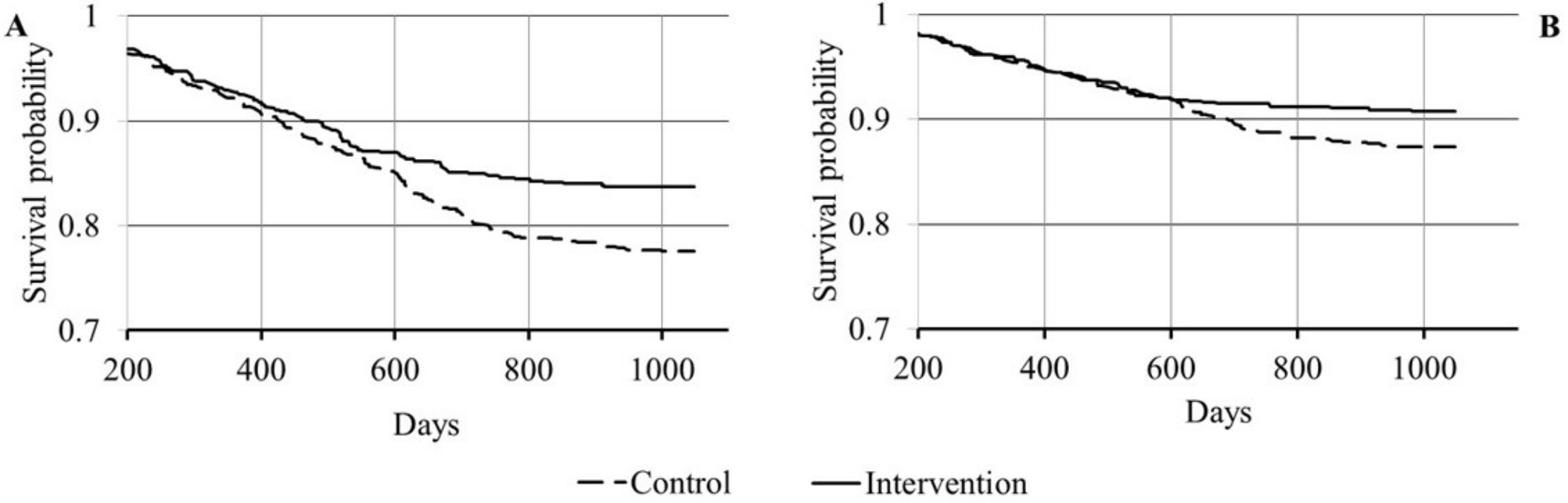
(**A**, occurrence of either recorded traffic offence or a collision, p=0.004) and of traffic **collisions (B**, p = 0.038) during the three-year study period.



Study 2: Univariate Cox regression models predicting high **general traffic risk** (occurrence of either recorded traffic offence or a collision)

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	HR (95% CI)
Excitement seeking	**1.07 (1.04-1.10)**
Fast decision-making	**1.07 (1.04-1.11)**
Thoughtlessness	1.02 (0.99-1.05)
Disinhibition	0.99 (0.95-1.02)
DAT1 VNTR, 9R carriers vs. 10R/10R	**1.28 (1.01-1.64)**

Study 2: Males high **general traffic risk** (occurrence of either recorded traffic offence or a collision) and **drunk driving** (DWI) by *DAT1* VNTR

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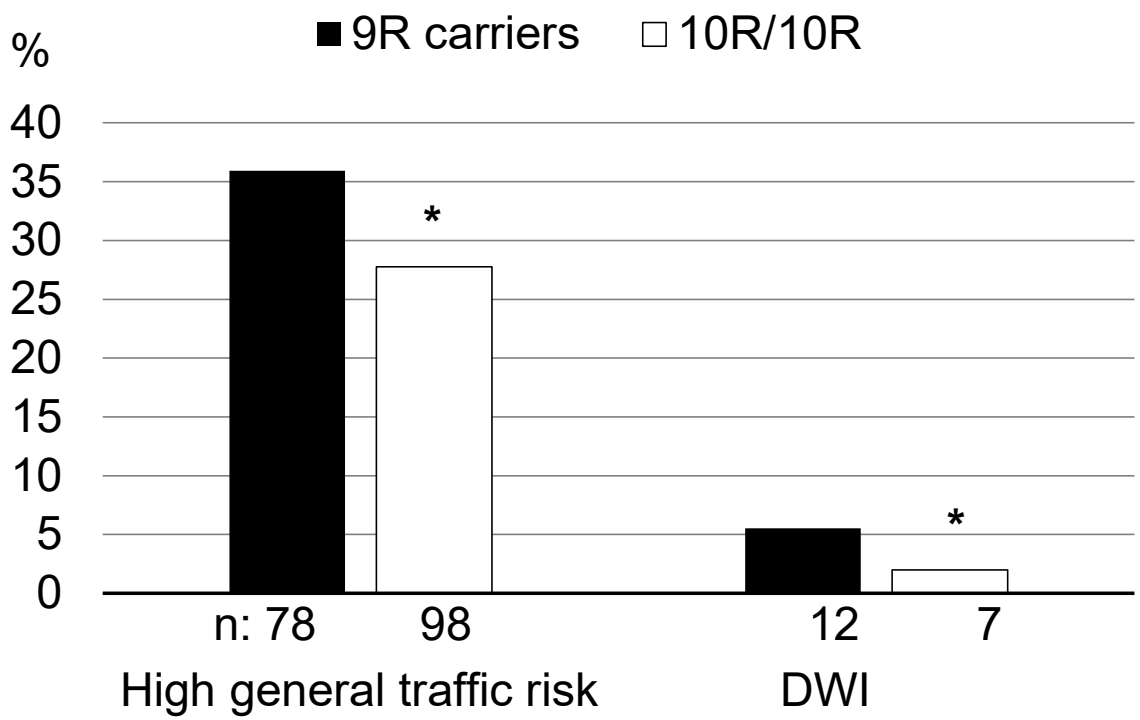

*p < 0.05, significant difference compared to *DAT1* VNTR 9R carriers

Study 2: Females high **general traffic risk (A**, occurrence of either recorded traffic offence or a collision), **traffic collisions (B), passive (C)** and **active traffic collisions (D)** by participation in intervention and *DAT1* VNTR

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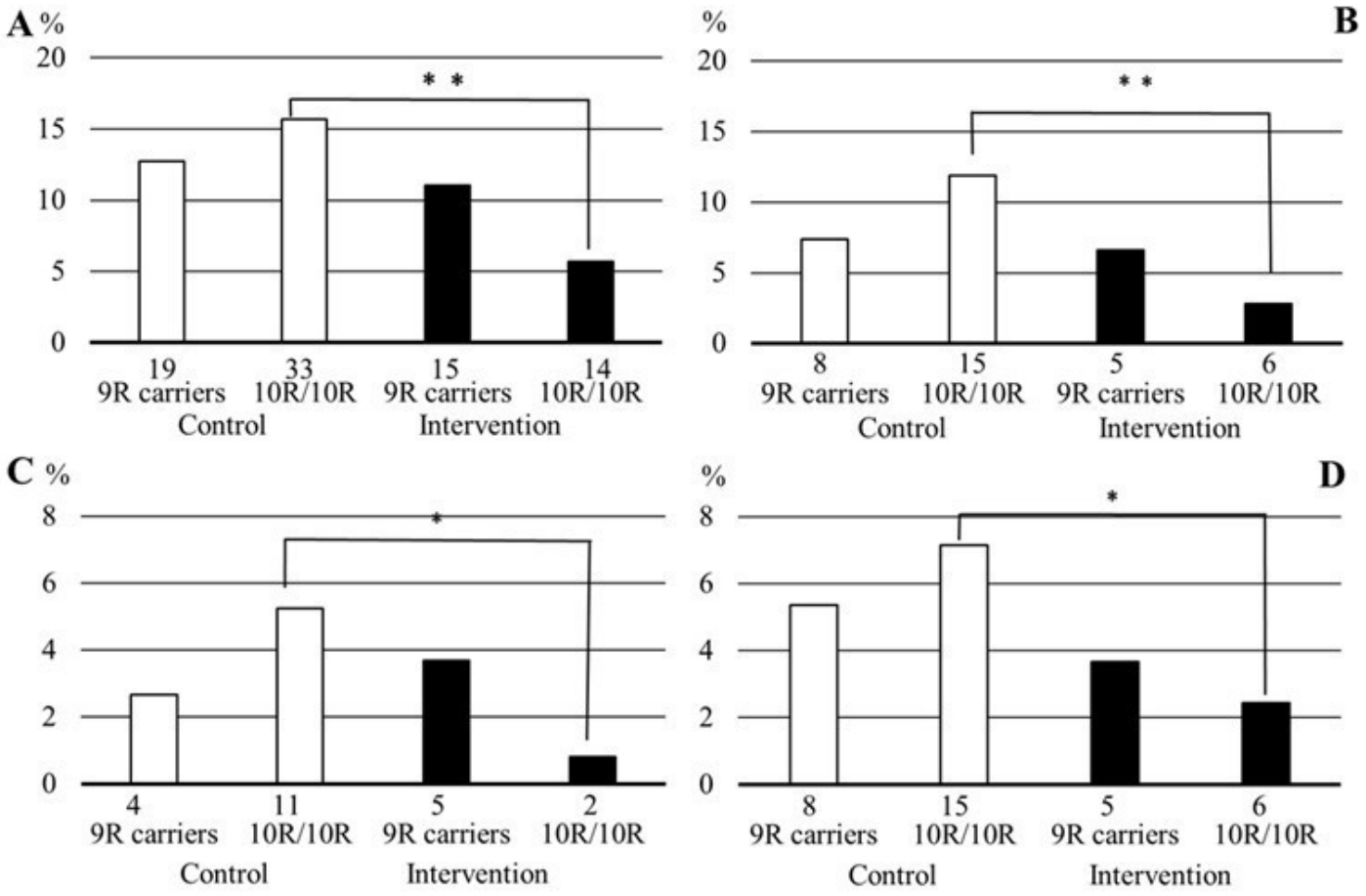

*p < 0.05, **p < 0.01, significant difference

Study 2: Females high general traffic risk (A, occurrence of either recorded traffic offence or a collision) and traffic collisions (B) by participation in intervention and 5-HTTRPL

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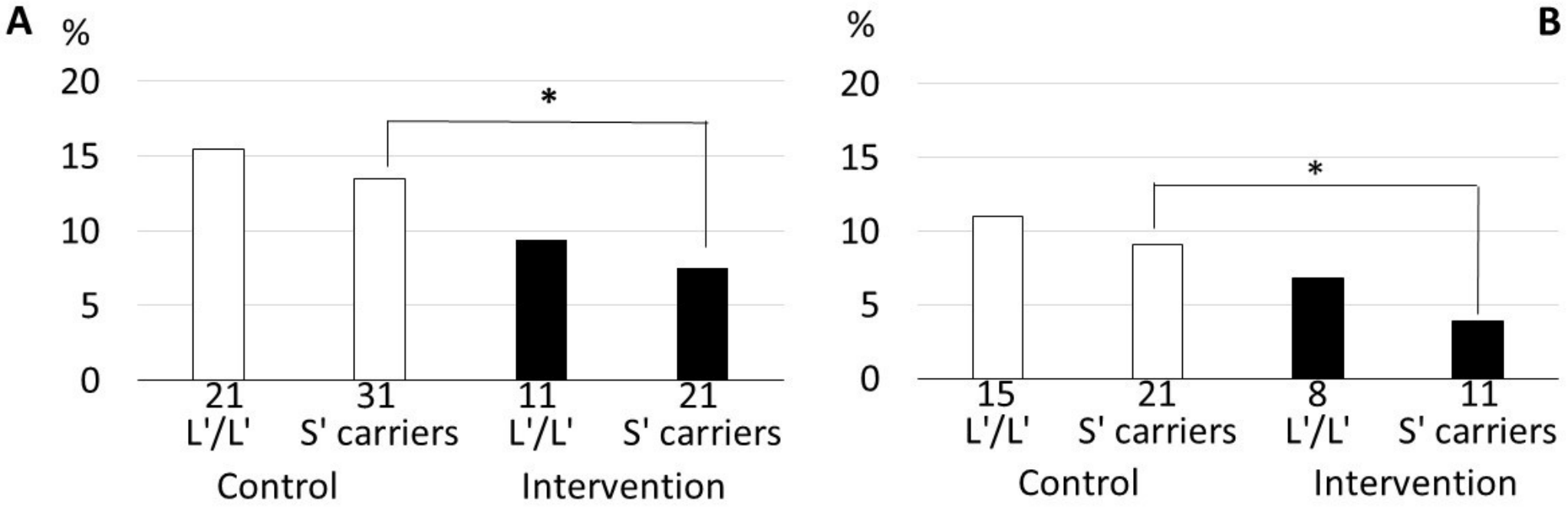

*p < 0.05, significant difference

Conclusions

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- The brief impulsiveness-focussed interventions - effective and suitable prevention activity in driving schools and it could be implemented in other countries.
- Web-based intervention „Reducing Impulsive Action in Traffic“
- New risk-groups in traffic - schoolchildren
- Our studies showed that both dopaminergic and serotonergic functioning in the brain are related to impulsive risk-taking behaviour in traffic, but differently by gender.

Thank you!

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