P.0318

Unhealthy lifestyle is associated with risk-taking in traffic and moderated by the serotonin transporter gene promoter polymorphism

Tõnis Tokko[1], Diva Eensoo[2], Kadi Luht-Kallas[3], Jaanus Harro[4]
[1] Department of Psychology, University of Tartu, Estonia
[2]Department of Chronic Diseases, National Institute for Health Development, Tallinn, Estonia
[3]Rescue College, Estonian Academy of Security Sciences, Tallinn, Estonia
[4]Chair of Neuropsychopharmacology, Institute of Chemistry, University of Tartu, Estonia

University of Tartu
ASTRA project PER ASPERA
Eat2be NICE
Investing in your future
European Union European Regional Development Fund

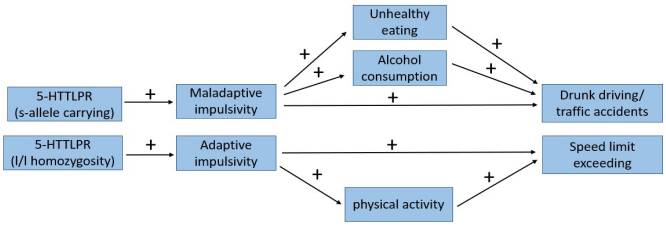
Introduction

- Road traffic injuries are a serious public health issue.
- Risk-taking behaviour has been associated with impulsivity and aggression and so is unhealthy lifestyle (alcohol/drug abuse, smoking, greater fast-food consumption).
- Impulsive behaviour has been associated with low capacity of the central serotonergic system. Serotonin transporter gene promoter polymorphism (5-HTTLPR) [1] has been associated with impulsivity, alcohol use, speed limit exceeding and traffic accidents [2;3].

The aim

- Find out whether subjects with less healthy lifestyles take more risks in traffic and whether impulsivity and the serotonin transporter genotype could mediate or moderate any such associations.

Figure 1. Schematic representation of the study concept.



Methods

A sub-sample (n = 817, 49.2% males and 50.8% females) of the Estonian Psychobiological Study of Traffic Behaviour (EPSTB [2;3;4] with mean age (SD) = 36.6 (12.4) years participated in this study. Subjects filled in:

- **Eating questionnaire;** Subjects answered questions about the frequency (1 – 7 , from never to several times in a day) of eating different foods and drinking energy drinks (n=816). As an indicator of unhealthy eating, we used the sum of scores of french fries and hamburgers (junk food consumption). As an indicator of healthy eating, we used the sum of scores of fruit/berries and vegetables.
- **The Alcohol Use Disorders Identification Test** (AUDIT) was used to identify subjects who have problematic alcohol consumption (n=744).
- **Physical activity and body mass index**. We asked subjects how much time they spent in the past week (hours per week) on vigorous physical activity (activities that require great physical energy and make the subject breathe a lot faster than regularly (e.g. doing hard work, exercising); (n=812). In addition, body mass index (BMI) was calculated by data provided by subjects about their height and weight (BMI = kg/m2, n=777).
- **Adaptive and Maladaptive Impulsivity Scale** with 24 items was used to measure different facets of impulsivity (adaptive impulsivity: fast decision-making and excitement seeking; maladaptive impulsivity: disinhibition and thoughtlessness; n = 772).
- **Buss - Perry Aggression Questionnaire** [5] with 29 items was used to measure aggression, anger and hostility (n = 744).

Data about **traffic accidents and violations** (driving while intoxicated by alcohol (DWI), speeding, other violations) during a 5-year period from Estonian Traffic Insurance Fund and Estonian Police and Border Guard Board databases (n=817).
5-HTTPR were genotyped: n = 644; l'/l' 32.0%; s'/l' 49.2%; s'/s' 18.8%;
l/l homozygotes were compared with the s' allele carriers.

Results

Table 1. Comparison of demographic and traffic behaviour variables between subjects with DWI (n = 18) and subjects with no DWI violations (n=799).

Independent variable	No DWI	DWI
Sex, male % (n)	48.2 (385)	94.4 (17)***
Age, mean (SD)	36.5 (12.4)	40.9 (13.2)
Healthy eating, mean (SD)	9.5 (2.4)	8.0 (1.9)**
Junk food consumption, mean (SD)	3.9 (1.0)	4.2 (1.6)
Energy drink consumption, once a week or more, % (n)	8.6 (69)	11.1 (2)
Alcohol problems (AUDIT), mean (SD)	4.7 (4.4)	9.7 (8.2)*
Vigorous physical activity (hours per week) mean (SD)	4.0 (6.5)	4.7 (8.0)
BMI (Body mass index), mean (SD)	25.4 (5.1)	26.8 (5.1)
Thoughtlessness, mean (SD)	15.0 (4.8)	16.1 (4.9)
Disinhibition, mean (SD)	17.2 (4.5)	19.2 (4.2)
Physical aggression (Buss-Perry), mean (SD)	14.8 (5.1)	19.2 (7.6)***
Verbal aggression (Buss-Perry), mean (SD)	12.6 (3.7)	14.3 (4.5)
Driving anger score (DAS 33), mean (SD)	57.2 (26.4)	69.5 (15.0)*
Traffic violations (speeding), % (n)	16.1 (129)	44.4 (8)**
Traffic violations (other), % (n)	19.0 (152)	72.2 (13)***

* p < 0.05, ** p < 0.01, *** p < 0.001 statistically significant difference.

Table 2. Comparison of demographic and traffic behaviour variables between speed limit exceeders (n=137) and subjects with no speeding ticket (n=680).

Independent variable	Subjects with no speeding ticket	Speed limit exceeders
Sex, male % (n)	42.5 (289)	82.5 (113)***
Age, mean (SD)	35.9 (12.0)	39.8 (14.0)**
Healthy eating, mean (SD)	9.5 (2.5)	9.4 (2.4)
Junk food consumption, mean (SD)	3.8 (1.0)	4.0 (1.1)
Energy drink consumption, once a week or more, % (n)	7.5 (51)	14.6 (20)**
Alcohol problems (AUDIT), mean (SD)	4.6 (4.5)	5.6 (4.7)*
Vigorous physical activity, hours per week, mean (SD)	3.7 (6.4)	5.7 (7.0)**
BMI (body mass index), mean (SD)	25.2 (5.0)	26.7 (5.8)**
Fast decision making, mean (SD)	17.9 (4.6)	20.0 (4.5)***
Excitement seeking, mean (SD)	18.8 (5.2)	21.7 (4.6)***
Physical aggression (Buss-Perry), mean (SD)	14.5 (5.0)	17.1 (5.9)***
Verbal aggression (Buss-Perry), mean (SD)	12.3 (3.6)	14.0 (4.0)***
Driver anger score (DAS 33), mean (SD)	55.7 (26.4)	64.6 (24.7)**
Traffic accidents, % (n)	22.2 (151)	52.6 (72)***
Traffic violations (DWI), % (n)	1.5 (10)	5.8 (8)**
Traffic violations (other), % (n)	14.7 (100)	47.4 (65)***

* p < 0.05, ** p < 0.01, *** p < 0.001 statistically significant difference.

Figure 2. Path analysis model for drunk driving (DWI; males, n = 402)

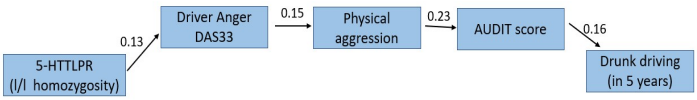
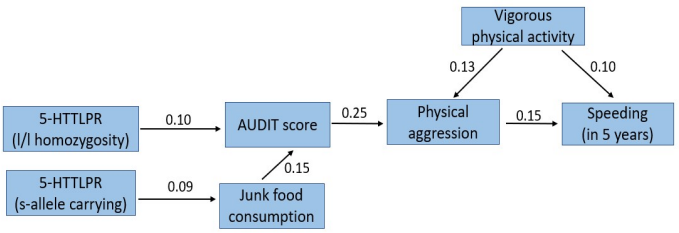


Figure 3. Path analysis model for speeding (n = 817)



Conclusions

- Significant associations exist between risky traffic behaviour and aspects of lifestyle such as consumption of alcohol or junk food or energy drinks, as well as engagement in vigorous physical activity.
- Traits such as aggressiveness and the variation in the serotonergic system appear as mediating and moderating factors of these associations.

Acknowledgements

We are grateful to the EPSTB participants, and the whole study team.
This work was implemented by the Estonian Research Council, the Estonian Ministry of Education and Science [grant number PRG1213].

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 728018.

Declaration of conflicting interests

The authors declare that they have no conflicts of interest.

References

[1] Lesch, K.-P., Bengel, D., Heils, A., Sabol, S.Z., Greenberg, B.D., Petri, S., Benjamin, J., Muller, C.R., Hamer, D.H., Murphy, D.L., 1996. Association of Anxiety-Related Traits with a Polymorphism in the Serotonin Transporter Gene Regulatory Region. Science 274, 1527–1531. doi:10.1126/science.274.5292.1527

[2] Eensoo, D., Paaver, M., Vaht, M., Loit, H.-M., Harro, J., 2018. Risky driving and the persistent effect of a randomized intervention focusing on impulsivity: The role of the serotonin transporter promoter polymorphism. Accident Analysis & Prevention 113, 19–24. doi:10.1016/j.aap.2018.01.021

[3] Luht, K., Tokko, T., Eensoo, D., Vaht, M., Harro, J., 2019. Efficacy of intervention at traffic schools reducing impulsive action, and association with candidate gene variants. Acta Neuropsychiatrica 31, 159–166. doi:10.1017/neu.2019.2

[4] Paaver, M., Eensoo, D., Pulver, A., Harro, J., 2006. Adaptive and maladaptive impulsivity, platelet monoamine oxidase (MAO) activity and risk-admitting in different types of risky drivers. Psychopharmacology 186, 32–40. doi:10.1007/s00213-006-0325-3

[5] Harro, J., Laas, K., Eensoo, D., Kurrikoff, T., Sakala, K., Vaht, M., Parik, J., Mäestu, J., Veidebaum, T., 2019. Orexin/hypocretin receptor gene (HCRTR1) variation is associated with aggressive behaviour. Neuropharmacology 156, 107527. doi:10.1016/j.neuropharm.2019.02.009