

Introduction

- Driving Behaviour Questionnaire (DBQ) has been used in several national and international studies. The DBQ has not yet been adapted to Estonian and Russian.
- It has been shown that driver errors and violations are two empirically distinct classes of behaviour. Errors are defined as the failure of planned actions to achieve their intended consequences (e.g. choosing the wrong traffic lane) and violations as deliberate deviations from those practices believed necessary to maintain the safe operation of a potentially hazardous system (e.g. speeding, drunk driving). Some authors have found third DBQ factor „slips and lapses“ that includes attention and memory failures.
- Majority of traffic accidents are associated with risky driving behaviour. Therefore DBQ could be validated by traffic violations and accidents registered by the police and the traffic insurance fund.
- The prevalence of psychiatric and behavioural disorders, including attention deficit hyperactivity disorder (ADHD), has increased during past decades, especially in younger age-groups. It can be assumed that their number has also increased among car drivers. Potential high-risk ADHD subjects in traffic could be distinguished from low risk subjects by DBQ indicators.

Table 1. Factor solution of the Estonian and Russian DBQ
F1 – factor „Errors“, F2 – factor „Violations“, F3 – factor „Lapses“

Items (number)	Estonian		Russian		
	F1	F2	F1	F2	F3
On turning right, nearly hit a cyclist who has come up on your inside (13)	0.75		0.51		
Miss "Give Way" signs, and narrowly avoid colliding with traffic having right of way (14)	0.74		0.65		
Misread the signs and exit from a roundabout on the wrong road (22)	0.73		0.47		
Pull out of a junction so far that the driver with right of way has to stop and let you out (10)	0.72		0.32		
Queueing to turn left onto a main road, you pay such close attention to the main stream of traffic that you nearly hit the car in front (5)	0.69		0.45		
Fail to notice that pedestrians are crossing when turning into a side street from a main road (6)	0.69		0.56		
Get into the wrong lane approaching a roundabout or a junction (4)	0.68		0.54		
Switch on one thing, such as the headlights, when you meant to switch on something else, such as the wipers (12)	0.68		0.51		
Fail to check your rear-view mirror before pulling out, changing lanes, etc (8)	0.66		0.65		
Brake too quickly on a slippery road, or steer the wrong way in a skid (9)	0.66		0.37		
Attempt to overtake someone that you hadn't noticed to be signalling a left turn (16)	0.65		0.56		
Underestimate the speed of an oncoming vehicle when overtaking (27)	0.63		0.43		
Hit something when reversing that you had not previously seen (1)	0.6		0.5		
Attempt to drive away from the traffic lights in third gear (15)	0.6		0.45		
Realise that you have no clear recollection of the road along which you have just been travelling (26)	0.59				0.68
Forget where you left your car in a car park (19)	0.58				0.65
Intending to drive to destination A, you "wake up" to find yourself on the road to destination B, perhaps because the latter is your more usual destination (2)	0.54				0.47
Disregard the speed limit on a motorway (28)		0.77		0.59	
Disregard the speed limit on a residential road (11)		0.75		0.64	
Stay in a motorway lane that you know will be closed ahead until the last minute before forcing your way into the other lane (18)		0.72		0.59	
Race away from traffic lights with the intention of beating the driver next to you (21)		0.72		0.61	
Cross a junction knowing that the traffic lights have already turned against you (24)		0.65		0.69	
Become angered by a certain type of a driver and indicate your hostility by whatever means you can (25)		0.65		0.77	
Drive so close to the car in front that it would be difficult to stop in an emergency (23)		0.62		0.67	
Sound your horn to indicate your annoyance to another road user (7)		0.62		0.67	
Overtake a slow driver on the inside (20)		0.59		0.54	
Drive when you suspect you might be over the legal blood alcohol limit (3)		0.57		0.31	
Become angered by another driver and give chase with the intention of giving him/her a piece of your mind (17)		0.54		0.66	
Eigenvalues	11.19	7.2	6.17	7.54	1.8
Variance (%)	30	22	18	13	7
Cronbach' alpha	0.83	0.82	0.76	0.84	0.55

The aim

- To adapt 28-item Manchester DBQ (Reason et al., 1990; Lawton et al., 1997) to Estonian and Russian;
- To validate DBQ by data from traffic insurance (traffic collisions) and police (traffic offences) databases in Estonian conditions;
- To assess traffic behaviour in ADHD groups.

Methods

Subjects from the longitudinal Estonian Psychobiological Study of Traffic Behavior (EPSTB) (Paaver et al., 2006; Paaver et al., 2013) and the longitudinal Estonian Children Personality Behaviour and Health Study (ECPBHS) (Luht et al., 2018) who had a driver's license and who had completed the DBQ, were selected for this study. Total of 1815 Estonian-speaking and 162 Russian-speaking car drivers (novice, young and experienced car drivers) participated in the adaptation of the DBQ. A total of 1050 subjects were selected from the EPSTB psychological intervention studies (Paaver et al., 2013; Luht et al., 2019), based on having completed the attention-deficit/hyperactivity disorder (ADHD) screening test, for the validation of the DBQ by collisions and traffic offences.

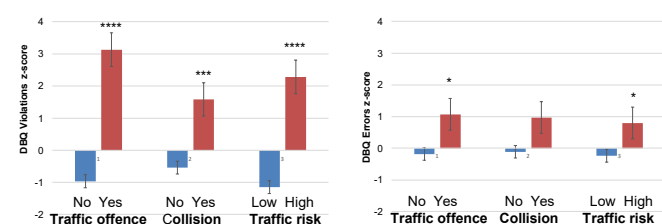
Subjects filled in:

- DBQ** - 28 statements on a 6-point scale of 0 (never) to 5 (almost always)
- Police and traffic insurance databases** -> **General traffic risk** (high - occurrence of either recorded traffic offence or a collision); (n=1050).
- Attention deficit-hyperactivity disorder (ADHD) Self-Report Scale** (Kessler et al., 2005) - 18-items, frequency of symptom occurrence in the past 6 months: 0 (never) to 4 (very often). Groups were formed according to ADHD subscales: 1) Hyperactivity/impulsivity and 2) Inattention separately by 50th percentile values; 3) If 4 of 6 screening symptoms were reported to be present „sometimes“ or „often“, then the subject was at high risk of ADHD; (n=1050).

Results

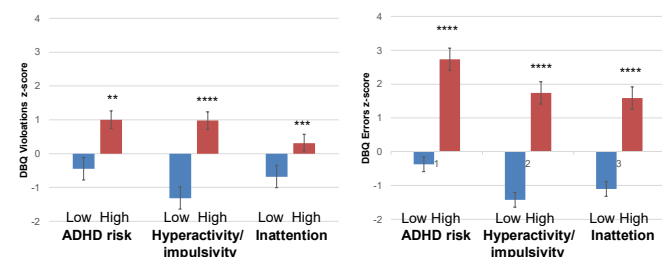
- Estonian DBQ showed two distinct classes of behaviour: driver errors and violations and this two-factor model explained 52% of the total data variability. For Russian DBQ a three-factor model (violations, errors, lapses) was the best, explaining 38% of the total variability (Table 1). As the factor structures of Estonian and Russian DBQ were somewhat different, the z-scores of the scales according to the language of the questionnaire were calculated.
- Based on police and traffic insurance databases traffic behaviour data, subjects with high traffic risk are significantly different from subjects with low traffic risk by their scores on the DBQ subscales, especially by DBQ Violations.

Figure 1. DBQ Violations and Errors (z-score mean±SE) by recorded traffic offence, collision and traffic risk



- The proportion of subjects with high ADHD risk was 14% (n = 244).

Figure 2. DBQ Violations and Errors (z-score mean±SE) by ADHD groups



* p<0.5, ** p<0.01, *** p<0.001, **** p<0.0001 – significant difference from respective „No“ or „Low“ risk groups.

Conclusion

- There might be some national and cultural differences in factorial structure of the DBQ.
- Although both errors and violations are potentially dangerous and could lead to a collision, the validation of the DBQ Violations scale by traffic offence and/or a collision was more evident.
- It is possible to differentiate potential high-risk subjects (e.g. high ADHD risk) from low risk subjects in traffic according to DBQ scales.