



Driving violations: the joint contribution of personality, anger, and passion

Infracciones de conducción: la contribución conjunta de la personalidad, la ira y la pasión

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Abstract

This study aims to explore the joint contribution of personality, driving anger, and passion in the prediction of driving violations. In addition, a profile of drivers more prone to commit driving violations was characterized. To achieve these ends, 569 drivers completed a self-report questionnaire. It was found that psychoticism, impulsivity, sensation-seeking, driving anger, and obsessive passion predicted driving violations. Moreover, the results demonstrated that driving anger and impulsivity mediated the effect of neuroticism on driving violations. Finally, it was observed that drivers with more driving violations were men, younger, had less driving experience, had more road accidents, and were responsible for more of them.

Keywords: Driving violations; personality; driving anger; passion for driving.

Resumen

Este estudio tiene como objetivo explorar la contribución conjunta de la personalidad, la ira al conducir y la pasión en la predicción de las infracciones de tráfico. Además, se caracterizó un perfil de conductores más propensos a cometer infracciones de tráfico. Para lograr estos objetivos, 569 conductores completaron un cuestionario de autoinforme. Se encontró que el psicoticismo, la impulsividad, la búsqueda de sensaciones, la ira al conducir y la pasión obsesiva predecían las infracciones de tráfico. Además, los resultados demostraron que la ira al conducir y la impulsividad mediaban el efecto del neuroticismo en las infracciones de tráfico. Finalmente, se observó que los conductores con más infracciones de tráfico eran hombres, más jóvenes, tenían menos experiencia al volante, habían tenido más accidentes de tráfico de los que mayormente eran responsables.

Palabras clave: Infracciones de tráfico; personalidad; ira al conducir; pasión por conducir.

Introduction

Driving transgressions and traffic accidents are critical social problems, being a product of an interaction between cognitive and emotional processes, personality, and situational variables ([van den Berg et al., 2020](#)). According to [WHO \(2018\)](#), 1.35 million people lost their lives due to traffic accidents, and between 20 to 50 million suffered injuries. In Portugal, between 2019 and the end of 2023, 157.795 accidents with victims were recorded, of which 2.751 were fatal, being above the European average ([ANSR, 2019, 2020, 2021, 2022, 2023](#)). Research studies show that human factor, namely problematic driving behaviours, is one of the most prevalent causes of traffic accidents in Western societies (e.g., [Găianu et al., 2020](#); [González-Iglesias et al., 2012](#); [Herrero-Fernández et al., 2024](#); [van den Berg et al., 2020](#)).

Despite the heterogeneity of definitions regarding problematic driving behaviours, there is a relative consensus that they refer to a pattern of behaviours perceived as potentially aggressive and harmful, putting the driver and others at risk ([Houston et al., 2003](#)). The *Manchester Driver Behavior Questionnaire* (DBQ), commonly used to measure aberrant driving behaviour ([Lawton et al., 1997](#); [Parker et al., 1995](#); [Reason et al., 1990](#)), makes a distinction between errors and driving violations, with intentionality being the critical element for such difference. Errors are unwanted results of involuntary actions, while violations are “deliberate deviations from those practices believed necessary to maintain the safe operation of a potential hazardous system” ([Reason et al., 1990, p.1316](#)). Driving violations are referred “to a social context in which behaviour is governed by operating procedures, codes of practices, rules, norms and the like” ([Reason et al., 1990, p.1316](#)). Moreover, there is evidence that those intentional acts are not scarce, being relevant predictors of road accidents ([King & Parker, 2008](#); [Parker et al., 1995](#); [Reason et al., 1990](#)).

The act of driving is a stressful situation, and several aspects, such as being in a hurry, the traffic, the competition with other drivers, wrong actions of others, and interaction with strangers in an environment where communication is complex, are identified as triggers of frustration and stress ([Joint, 1995](#); [Jovanović et al., 2011](#)).

Driving violations and sociodemographic variables

Driving violations are associated with different sociodemographic variables, including sex, age, and driving experience ([Aluja et al., 2023](#); [Richer & Bergeron, 2012](#)). Younger drivers and men are more prone to drive aggressively and commit more violations than women and older drivers (e.g., [Aluja et al., 2023](#); [Asbridge et al., 2003](#); [Krahé, 2005](#)). Regarding driving experience, [Shi et al. \(2010\)](#) showed that novice drivers (0-4 driving years) and those with more than 12 years of driving had fewer violations than drivers with 4-12 years of experience. Also, [Xie and Parker \(2002\)](#) demonstrated that driving experience negatively predicted driving violations.

Personality and driving violations

Using the five-factor model of personality ([Costa & McCrae, 1992](#)), the research assessed the extent to which the Big Five factors predicted aggressive driving and driving violations. The results are consensual in demonstrating an association between higher levels of neuroticism, lower levels of

conscientiousness, and agreeableness with aggressive driving (e.g., Benfield et al., 2007; Dahlen & White, 2006; Dahlen et al., 2012; Harris et al., 2014; Jovanović et al., 2011) and driving violations (Găianu et al., 2020). Nonetheless, the studies demonstrate mixed results regarding extraversion and openness to experience. Although most studies show a positive association between extraversion, aggressive driving (e.g., Benfield et al., 2007; Harris et al., 2014) and driving violations (Lev et al., 2008), these results are not consensual. Dahlen and White (2006) and Dahlen et al. (2012) did not find any correlation between this trait and aggressive driving, while Jovanović et al. (2011) showed the existence of a negative association. Regarding openness to experience, while some studies show the existence of positive (Dahlen & White, 2006) and negative (Harris et al., 2014) associations with aggressive driving, others did not find any association (e.g., Benfield et al., 2007; Dahlen et al., 2012; Jovanović et al., 2011).

Common results were found using Eysenck's Personality Theory. According to this model, personality is described with a three-factor model (extraversion, neuroticism, and psychoticism) and a fourth component (lie scale). The research is consensual in demonstrating the existence of positive associations between neuroticism, risky driving, and driving violations (Wang et al., 2019; Tao et al., 2017). Regarding extraversion, some studies show the existence of a positive relationship with driving violations (e.g., Wang et al., 2019; Renner & Anderle, 2000), while Tao et al. (2017) reported a negative association. Concerning psychoticism, the research shows the existence of positive correlations between driving violations and involvement in accidents (Agra & Queirós, 2004; Tao et al., 2017). Furnham and Saipé (1993) found that convicted drivers scored higher in psychoticism and lower in neuroticism than non-convicted ones. Nevertheless, Renner and Anderle (2000) did not find such differences when comparing a group of traffic offenders with a control group. The impact of the lie scale on driving behaviour is scarce. The lie scale initially measures social desirability; however, Francis (1961) states that this scale also measures social conformity and can be considered a personality dimension or trait. Tao et al. (2017) demonstrated that the lie scale was negatively correlated with driving violations, speeding, errors, and lapses. The authors also found that the lie scale was a predictor of risky driving behaviours, along with neuroticism and psychoticism.

In addition to the two referred personality models, sensation-seeking and impulsivity have been found to be predictors of aggressive and risky driving. In a review of Jonah (1997), 36 of 40 studies demonstrated a positive relationship between sensation-seeking and at least one of varied risky driving (e.g., speeding). A more recent meta-analysis found a positive correlation with risky and aggressive driving (Zhang et al., 2019).

Bıçaksız and Özkan (2016) conducted a systematic review of the relationship between impulsivity and a variety of driving-related outcomes. Despite the diversity of constructs and measures of impulsivity, most studies found positive relationships between impulsivity and aberrant driving, with violations being the most consistent outcome observed. Moreover, impulsivity was also positively associated with driving anger and aggression.

Psychological driving related variables

Driving anger, one of the most explored variables related to problematic driving, is defined as frequent and intense anger while operating a motor vehicle (Deffenbacher et al., 1994, p.84).

Research is consensual, demonstrating that driving anger is positively correlated with violations and aggressive driving (e.g., [Bachoo et al., 2013](#); [Dahlen et al., 2012](#); [Deffenbacher et al., 1994](#); [González-Iglesias et al., 2012](#); [Jovanović et al., 2011](#)). Concerning its relationship with personality, empirical research demonstrates the existence of negative associations with emotional stability ([Dahlen & White, 2006](#)), agreeableness, conscientiousness, and openness ([Benfield et al., 2007](#)). Moreover, [Jovanović et al. \(2011\)](#) revealed that neuroticism was associated with aggressive driving through driving anger.

Another psychological variable that has been explored is driving passion. Passionate drivers are individuals who like to drive, value it highly, invest time and energy in it, and internalize this activity in their identity ([Philippe et al., 2009](#)). The Dualistic Model of Passion ([Vallerand et al., 2003](#)) posits two types of passion: obsessive and harmonious. The obsessive type leads people to experience an uncontrollable urge to engage in the activity ([Vallerand, 2008](#)). Obsessive driving is simultaneously pleasant and like an obligation ([Philippe et al., 2009](#)). By contrast, harmonious passion is an intense desire that stays under the person's control because it concurs with their authentic selves ([Philippe et al., 2009](#)). The research demonstrated that obsessive, but not harmonious passion is positively associated with aggressive driving behaviour ([Philippe et al., 2009](#)).

Given this theoretical and empirical background, this study aims to jointly analyze the contribution of personality, driving anger, and passion for driving-on-driving violations, controlling for sex, age, and driving experience. Moreover, this research aims to provide a driver profile that is more prone to higher driving violation scores.

Method

Sample and procedure

A group of drivers from the North of Portugal were invited to participate in the study, with the individuals being recruited face to face by a member of the research team. Firstly, informed consent was requested. The subjects were informed about the objectives of the study, and the opportunity to withdraw was provided. The anonymity and confidentiality were guaranteed. After completed the informed consent, a paper-and-pencil questionnaire was fill-up in the presence of a researcher. The sampling strategy adopted was a convenience sample, given that the participants were those available to participate in the study. The only criteria for participation were having a valid driving license and being an active driver.

The final sample consisted of 569 drivers (52.8% males), aged between 18 and 71 years old ($M = 35.85$, $SD = 12.42$). The participants reported driving, on average, for 14.49 years ($SD = 10.71$), and the majority (75%) affirmed driving every day (Table 1). Moreover, the majority of the participants reported having been involved in road accidents ($n = 362$, 64.8%, $M = 2.13$) during the entire course of their driving experience, and 26.90% ($n = 150$) stated that they had driven before having a legal license. Finally, 48 (8.50%) of the subjects already had their driver's license apprehended, and 61 (10.90%) transported a self-defence object in the car.

Table 1

Participants' socio-demographic and driving characteristics.

Variables	N	M (SD)	F	%
Age	562	35.85 (12.42)	-	-
Sex	566			
Male	-		299	52.8
Years of driving	549	14.49 (10.71)	-	-
Regularity of driving	561			
Only a few times a year	-		7	1.2
Only a few times a month	-		11	2
Only on weekends	-		21	3.7
Only during working days	-		14	2.5
Some days a week	-		87	15.5
Every day	-		421	75
Involvement in road accidents	559			
Yes	-		362	64.8
Number of Accidents	352	2.13 (1.46)	-	-
Number of Accidents responsibility	350	.81 (.88)	-	-
Driver's license apprehension	562			
Yes	-		48	8.5
Number of Driving fines	550	1.73 (4.02)	-	-
Driving without license	568			
Yes	-		150	26.9
Self-defense object	562			
Yes	-		61	10.9

Note. N = number of subjects; M = mean; SD = standard deviation; F = frequency; % = percentage

Measures

Driving Behavior Questionnaire (DBQ)

The DBQ (Parker et al., 1995) comprises twenty-four items describing different situations/behaviours that can occur while driving and aims to measure errors, lapses, and violations in this context. Subjects were asked to indicate how often they commit each of the behaviours, using a 5-point scale, ranging from "Never" to "Almost ever". The current study used the "Driving violations" subscale as a dependent variable. The variable score varies between 8 and 40. The reliability of this scale in our sample was $\alpha = .79$.

Driving Anger Scale short form (DAS-SF)

The DAS-SF (Deffenbacher et al., 1994) consists of fourteen items representing provocative situations in the driving context. Subjects were instructed to imagine that each situation happened to them and to rate the amount of anger elicited by each one on a 5-point scale, ranging from "Not at all" to "Very much". The variable "Driving anger" score varies between 7 and 35, and our sample's reliability was $\alpha = .88$.

Barratt Impulsiveness Scale - version 11 (BIS-11)

The BIS-11 (Patton et al., 1995) consists of thirty items describing different ways of acting that aim to measure impulsivity. The items were scored on a 4-point scale ranging from "Never/almost never" to "Almost always/always". The scale total score varies between 30 and 120. The reliability of the variable "Impulsivity" in our sample was $\alpha = .71$.

Driving Passion Scale (DPS)

The DPS aims to measure passion for driving (Philippe et al., 2009). The scale is divided into two subscales (6 items each): obsessive and harmonious passion. Subjects were asked to rate their degree of concordance using a 7-point scale varying from "Do not agree at all" to "Very strongly agree". The score of each subscale varies between 7 and 42. The reliability in our sample was $\alpha = .84$ and $\alpha = .76$ for "Obsessive passion" and "Harmonious passion" variables, respectively.

Revised Eysenck Personality Questionnaire – Short Scale (EPQR-S)

The EPQR-S is a forty-eight-item scale that measures the three major dimensions of personality (extraversion, neuroticism, psychoticism), including a lie scale - twelve items for each subscale (Eysenck et al., 1985). Subjects were asked to answer "Yes" or "No" to the items. The score of each dimension varies between 0 and 12. The reliability in our sample was $\alpha = .83$, $\alpha = .77$, $\alpha = .40$, and $\alpha = .68$ for the variables "Extraversion", "Neuroticism", "Psychoticism", and "Lie scale", respectively.

Sensation Seeking Scale – form V (SSS-V)

The SSS-V (Zuckerman, 1994) is a forty-item scale that measures sensation-seeking. Each item has two choices, and the subjects were asked to choose the option that better describes their preferences or how they feel. SSS-V score varies between 0 and 40. The reliability in our sample for the variable "Sensation seeking" was $\alpha = .83$.

Sociodemographic, driving experience and driving incidents

Regarding sociodemographic variables, the individuals were asked to report their age and sex (0 - female; 1 - male). The driving experience questions asked participants to report their years of driving license, as well as their regularity of driving (6-point scale, varying from "Only a few times a year" to "Every day"). Concerning driving incidents, it was asked to the participants if they ever been involved in road accidents (prevalence: yes/no), and if yes, how many (frequency) Also, it was asked to the participants to report in how many road accidents they have been considered responsible. Finally, it was asked to the subjects if during their experience as a driver their driver's license had ever been apprehended (yes or no), how many driving fines they had during their entire driving experience, if they drove before having a license (yes/no), and if they use a self-defence object while driving (yes/no).

Statistical analysis

The statistical analyses were performed using IBM SPSS 26. Descriptive statistics were employed to characterize the sample and Pearson's r correlations coefficients to explore the relationships between the variables under study. Hierarchical Ordinary Least Square (OLS) Regressions were conducted to identify significant associations between the independents and the dependent variable. To examine the mediational role of driving anger and impulsivity on the relationship between neuroticism and driving violations, PROCESS 3.5 (Hayes, 2017) was used. To characterize a driver's profile according to driving violations, two groups (high and low) were created based on the median (Mdn = 6) value of driving violations. One sample t-test and chi-square test were used to determine differences between these groups. Regarding the normality of the data, since the sample size is large, we assume the Central Limit Theorem.

Results

The descriptive statistics of the studied variables are presented in Table 2. The analysis revealed the existence of significant differences between women and men. Given that, the partial bivariate correlations, controlling for sex, were conducted (Table 3). The results indicated significant and positive relations between driving violations (dependent variable), impulsivity ($r = .50$), sensation seeking ($r = .38$), driving anger ($r = .40$), obsessive passion ($r = .33$), psychoticism ($r = .31$) and neuroticism ($r = .17$). Also, the results show the existence of a significant and negative relationship between driving violations and lie scale ($r = -.44$).

Table 2

Descriptive statistics of all the variables under study

	Total sample			Women			Men			P
	N	M(SD)	Min-Max	N	M(SD)	Min-Max	N	M(SD)	Min-Max	
1. Driving Violations	555	6.88(5.25)	0-29	263	5.47(4.21)	0-27	290	8.21(5.74)	0-29	<.001
2. Driving anger	553	42.87(10.32)	5-70	263	43.71(10.02)	9-70	288	42.21(10.52)	5-70	.087
3. Psychoticism	557	2.31(1.52)	0-8	264	2.19(1.37)	0-6	291	2.42(1.64)	0-8	.074
4. Neuroticism	557	4.93(2.91)	0-12	264	5.39(2.96)	0-12	291	4.52(2.81)	0-12	<.001
5. Extraversion	557	8.27(3.07)	0-12	264	8.53(2.85)	0-12	291	8.02(3.25)	0-12	.049
6. Lie scale	557	7.65(2.56)	0-12	264	8.00(2.36)	0-12	291	7.33(2.69)	0-12	.002
7. Impulsivity	557	59.87(8.75)	2-89	264	60.21(8.33)	31-89	291	59.75(8.87)	2-82	.540
8. Sensation seeking	554	15.30(6.38)	2-33	261	13.61(6.15)	3-32	291	16.85(6.20)	2-33	<.001
9. Harmonic passion	552	28.17(7.65)	5-42	262	28.44(7.99)	5-42	288	27.96(7.33)	6-42	.469
10. Obsessive passion	552	11.30(6.68)	6-42	262	10.18(6.10)	6-42	288	12.28(6.99)	6-41	<.001

Note: N: number of subjects; M: mean; SD: standard deviation; Min-Max: Minimum-Maximum.

Table 3

Partial correlations controlling for sex between all the variables under study

	2	3	4	5	6	7	8	9	10	Age	Driving fines	Number accidents
1. Driving Violations	.40***	.31***	.17**	.05	-.44***	.50***	.38***	.10	.33***	-.39***	.17**	.09
2. Driving anger		.12*	.25***	-.07	-.13*	.33***	.05	.06	.15**	-.11*	.08	.05
3. Psychoticism			.06	.03	-.14**	.23***	.18***	.09	.26***	-.03	.07	-.04
4. Neuroticism				-.23***	-.11*	.24***	-.05	-.03	.19***	-.03	-.04	-.03
5. Extraversion					.02	-.05	.24***	.21***	.13*	-.21***	-.02	.04
6. Lie scale						-.43***	-.40***	.00	-.13*	.26***	-.06	.05
7. Impulsivity							.32***	-.07	.29***	-.27***	.20***	-.10
8. Sensation seeking								.06	.15**	-.48***	.02	.00
9. Harmonic passion									.30***	-.02	-.03	.08
10. Obsessive passion										-.17**	.17**	-.02

Note: Significant effect are in bold type face for emphasis. * Correlation is significant at the 0.05 level (2-tailed) ** correlation is significant at the 0.01 level (2-tailed); *** correlation is significant at the 0.001 level (2-tailed)

Predictors of driving violations

A hierarchical regression analysis was performed (Table 4). Age, sex, and regularity of driving were entered in the first block and explained 18% of the variance of driving violations ($F(3,531) = 38.94$, $p < .001$). After the introduction of EPQR-S variables, the model explained 32% of the total variance ($F(7,527) = 34.77$, $p < .001$). The variable with the largest effect was the lie scale ($\beta = -.29$, $p < .001$), followed by psychoticism ($\beta = .19$, $p < .001$) and neuroticism ($\beta = .11$, $p = .005$). After the introduction of impulsivity and sensation-seeking, the model explained 38% of the total variance in driving violations ($F(9,525) = 35.57$, $p < .001$). Only impulsivity had a significant effect on the dependent variable ($\beta = .28$,

$p < .001$). In this step, psychoticism and lie maintained their contribution, unlike neuroticism. Finally, the two variables of passion and driving anger were entered and the model explained 47% of the total variance ($F(12,522) = 38.33$, $p < .001$). The variable with the biggest effect was driving anger ($\beta = .26$, $p < .001$), followed by obsessive passion ($\beta = .19$, $p < .001$). The personality dimensions, driving anger, and passion for driving explained 29% of the variance of driving violations. In the final model, the variable with the largest effect continued to be driving anger ($\beta = .26$, $p < .001$), followed by lie scale ($\beta = -.19$, $p < .001$), obsessive passion ($\beta = .19$, $p < .001$), impulsivity ($\beta = .18$, $p < .001$), psychoticism ($\beta = .11$, $p = .002$) and sensation-seeking ($\beta = .09$, $p = .037$).

Table 4

Hierarchical regression analysis predicting driving violations

Step	Predictor	B	SE	β	R^2	R^2 change	F	p
1					.180	.180	38.943	<.001
	Age	-.139	.016	-.334***				
	Sex (0 - female; 1 - male)	2.897	.413	.280***				
	Regularity of driving	.451	.210	.086*				
2					.316	.136	34.765	<.001
	Age	-.098	.016	-.238***				
	Sex (0 - female; 1 - male)	2.418	.393	.234***				
	Regularity of driving	.634	.195	.121***				
	Psychoticism	.631	.124	.185***				
	Neuroticism	.190	.068	.107**				
	Extraversion	.042	.065	.025				
	Lie scale	-.596	.078	-.293***				
3					.379	.063	35.567	<.001
	Age	.065	.017	-.157***				
	Sex (0 - female; 1 - male)	2.286	.397	.221***				
	Regularity of driving	.692	.187	.132***				
	Psychoticism	.451	.122	.132***				
	Neuroticism	.083	.067	.047				
	Extraversion	.027	.063	.016				
	Lie scale	-.391	.081	-.192***				
	Impulsivity	.178	.026	.281***				
	Sensation seeking	.051	.038	.063				
4					.468	.090	38.327	<.001
	Age	-.055	.016	-.133***				
	Sex (0 - female; 1 - male)	1.856	.379	.179***				
	Regularity of driving	.647	.174	.124***				
	Psychoticism	.359	.115	.105**				
	Neuroticism	-.062	.065	-.035				
	Extraversion	-.016	.060	-.010				
	Lie scale	-.392	.076	-.193***				
	Impulsivity	.114	.025	.179***				
	Sensation seeking	.075	.036	.092*				
	Driving anger	.133	.017	.264***				
	Harmonic passion	-.008	.023	-.012				
	Obsessive passion	.149	.029	.186***				

Note. *Correlation is significant at the 0.05 level (2-tailed); **Correlation is significant at the 0.01 level (2-tailed);

**Correlation is significant at the 0.001 level; B= Unstandardized beta; SE= Standard error; β = Standardized Beta;

F= F-change; p= p value

Direct and indirect effects of personality on driving violations

To better understand the relation between neuroticism and driving violations (observed in step 2 of the Hierarchical OLS regression), it was tested the direct and indirect effects by which neuroticism potentially affects driving violations through driving anger and impulsivity. As displayed in Table 5 and Figure 1, the relation between neuroticism and driving violations was fully mediated by driving anger and impulsivity. The indirect effect of neuroticism via driving anger was positive [B=.11; 95% CI (.07, .17)], and the same occurs via impulsivity [B=.19; 95% CI (.12, .27)]. These results indicate that higher levels of neuroticism contribute to an increase in levels of driving anger and impulsivity, which, in turn, leads to more driving violations.

Figure 1

Mediational results for driving violations

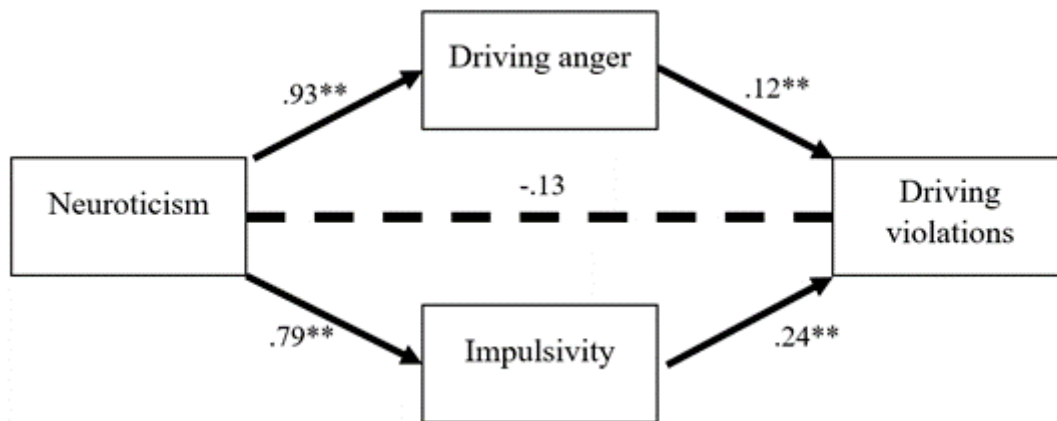


Table 5

Direct and indirect effects of neuroticism, driving anger and impulsivity on driving violations

Direct effects	B	SE B	LLCI	ULCI	T	p
Neuroticism	-13	.07	-.27	.01	-1.87	.062
Driving anger	.12	.02	.09	.16	6.20	.000
Impulsivity	.24	.02	.19	.29	9.78	.000
Constant	-12.37	1.47	-15.27	-9.48	-8.39	.000
R	.50					
R-square	.25					
p value	.000					
Indirect effects	B	BootSE	BootLLCI	BootULCI		
Driving anger	.11	.02	.07	.17		
Impulsivity	.19	.04	.12	.27		

Note. B= Beta; SE B= Standard error for the unstandardized beta; LLCI= Lower level of confidence interval; ULCI= Upper level of confidence interval; t= Test of statistical significance; p= p-value

Driver profile according to driving violations

Subjects with higher levels of driving violations, compared to the remaining, i.e., with lower levels of driving violations, were younger [$t(536.007) = 7.249, p < .001$] and had fewer years of driving experience [$t(540) = 5.142, p < .001$]. Moreover, they had more driving fines [$t(300.253) = -2.592, p =$

.010], more accidents [$t(301.591) = -2.435$, $p = .015$], and were responsible for more [$t(344) = -3.790$, $p < .001$]. The group of high driving violations had proportionally more men, [$\chi^2(1) = 20.89$, $p < .001$], more drivers that reported driving before having a license [$\chi^2(1) = 7.743$, $p = .005$] and transporting a self-defence object [$\chi^2(1) = 9.223$, $p = .002$] (Tables 6 and 7).

Table 6

Differences between drivers: high vs low in driving violations (t-test)

Variables	High in Driving Violations		Low in Driving Violations		t	P	d
	N	M(SD)	N	M(SD)			
Age	254	31.94 (11.23)	308	39.07 (12.45)	7.249	<.001	11.91
Years of driving	243	11.90 (10.17)	306	16.56 (10.69)	5.142	<.001	10.46
Number of driving fines	242	2.26 (5.39)	308	1.30 (2.39)	-2.592	.010	4.00
Number of Accidents_Total	163	2.34 (1.62)	189	1.95 (1.30)	-2.435	.015	1.45
Number of Accidents_Responsibility	161	1.00 (1.06)	189	.64 (.67)	-3.790	<.001	.87

Note. N= Number of subjects; M(SD)= Mean (Standard deviation); p= p value; d-effect size (d-cohen)

Table 7

Differences between drivers: high vs low in driving violations (chi-square test)

	High in driving violations		Low in driving violations		p-value	OR
	N	%	N	%		
Sex						
Female	88	35.5	175	66.5	$\chi^2(1) = 20.89$ $p = .001$	2.22
Male	153	52.8	137	47.2		
Driver's license apprehension						
Yes	24	51.1	23	48.9	$\chi^2(1) = 1.195$ $p = .274$	
No	217	42.8	290	57.2		
Driving without license						
Yes	78	53.4	68	46.6	$\chi^2(1) = 7.743$ $p = .005$	1.71
No	162	40.1	242	59.9		
Accidents						
Yes	162	45.4	195	54.6	$\chi^2(1) = 1.655$ $p = .198$	
No	77	39.7	117	60.3		
Self-defence object						
Yes	37	61.7	23	38.3	$\chi^2(1) = 9.223$ $p = .002$	2.30
No	203	41.1	291	58.9		

Note. N= Number of subjects; %= percentage. OR- Odds Ratio

Discussion

The present work had two main goals: firstly, to explore the joint contribution of personality, driving anger, and driving passion on driving violations; secondly, to characterize a profile of individuals according to driving violations. To the best of our knowledge, this is the first study that attempts to analyse the role of these variables together in driving violations. Findings are highlighted, namely: driving violations are predicted by psychoticism, impulsivity, sensation-seeking, driving anger, and obsessive passion; driving anger and impulsivity fully mediated the effect of neuroticism on driving violations; individuals with more driving violations were men, younger, with less driving experience, had a higher number of road accidents and were responsible for more of them.

Regarding the dimensions of EPQ, the predictive power of psychoticism and neuroticism on driving violations is consistent with earlier research (Furnham & Saïpe, 1993; Wang et al., 2019; Tao et al., 2017). However, the expected positive relationship between extraversion and driving violations was not observed. Nevertheless, the empirical research is not consensual regarding the effect of this dimension on problematic driving.

The analyses revealed that the effect of neuroticism on driving violations was fully mediated by driving anger and impulsivity. Regarding driving anger, this finding is in accordance with Jovanović et al. (2011), who showed that neuroticism predicted aggressive driving behaviour through driving anger. Regarding impulsivity's mediational effect, Eysenck and Eysenck (1977) support our results. According to these authors, neuroticism reflects proneness to negative emotional experiences, and high levels of neuroticism are often associated with narrow impulsivity, one of the four factors of this dimension, and behavioural dysregulation. Moreover, Whiteside and Lynam (2001, p.685) pointed out that the likelihood of engaging in impulsive behaviours could be related to "alleviate negative emotions," despite the harmful consequences. Thus, highly neurotic individuals are more likely to react impulsively in stressful situations, experience more impatience and irritation, being more prone to perform driving violations.

Consistent with previous research, our findings revealed that obsessive passion for driving was associated with driving violations, unlike harmonious passion. As referred by Phillipe et al. (2009), harmonious passion for driving leads to a more adaptive activity and provides internal self-regulation in stressful situations that interfere with driving pleasure. Contrariwise, obsessive drivers tend to be less flexible in dealing with frustration, which impedes a pleasant driving activity and could lead to problematic driving (Phillipe et al., 2009).

Considering the two groups of drivers, high and low on driving violations, this study revealed that drivers with more driving violations were younger men with less driving experience and more accidents and were responsible for more of them. These results are in accordance with the metanalytic study of de Winter and Dodou (2010), which showed that violations were positively correlated with accident involvement. Moreover, the authors showed that violations were a stronger predictor of accidents among young drivers than old drivers. These findings can be explained by the fact that novice drivers lack driving skills, tend to overestimate their driving ability, being less aware and underestimating personal risk (Lancaster & Ward, 2002; Liu et al. 2022; Magaña et al., 2021).

This study has some limitations. First, being a cross-sectional study, the findings are correlational instead of causal. Second, besides having a relatively good sample size, the results were derived from a convenience sample, which limits the generalizability of the results. Thus, a larger and more representative sample is recommended. Third, subjects were asked to report their driving incidents during their entire life course, which could lead to inaccuracies. Finally, the association found between the lie scale and driving violations, our dependent variable, warrants attention. Given that individuals may seek social desirability and therefore report fewer violations, this relationship highlights the potential bias in self-reported data.

Our study's findings and limitations highlight the importance of studying problematic driving behaviour with a mixed methodology, combining qualitative and quantitative methods. It will be interesting to explore driving experiences and their relationship with driving functions, related motivations, and patterns of transgressive behaviours while driving. To overcome self-reported

limitations, driving simulators could be used to test the relationship between personality and driving behaviours in a more naturalistic environment.

Referencias bibliográficas

- Agra, C., & Queirós, C. (2004). O comportamento de condução oculta a delinquência? Estudos empíricos da Escola de Criminologia da FDUP. *Revista da Faculdade de Direito da Universidade do Porto, 1*, 59-81.
- Aluja, A., Balada, F., García, O., & García, L. F. (2023). Psychological predictors of risky driving: the role of age, gender, personality traits (Zuckerman's and Gray's models), and decision-making styles. *Frontiers in psychology, 14*, 1058927. <https://doi.org/10.3389/fpsyg.2023.1058927>
- Asbridge, M., Smart, R. G., & Mann, R. E. (2003). The "Homogamy" of road rage: understanding the relationship between victimization and offending among aggressive and violent motorists. *Violence and Victims, 18*(5), 517-531. <https://doi.org/10.1891/vivi.2003.18.5.517>
- Autoridade Nacional de Segurança Rodoviária - ANSR (2019). Relatório Anual de Segurança Rodoviária 2019. República Portuguesa, Administração Interna. <http://www.ansr.pt/Estatisticas/RelatoriosDeSinistralidade/Documents/2019/Relat%C3%B3rio%20Anual%20Sinistralidade%20Rodovi%C3%A1ria%202019.pdf>
- ASNR - Autoridade Nacional de Segurança Rodoviária (2020). Relatório Novembro 2020. Retrieved from Autoridade Nacional de Segurança Rodoviária <http://www.ansr.pt/Estatisticas/RelatoriosDeSinistralidade/Pages/default.aspx>
- Autoridade Nacional de Segurança Rodoviária - ANSR (2021). Relatório Anual 2021. Unidade de Prevenção e Segurança Rodoviária, divisão de Observatório de Segurança Rodoviária. <http://www.ansr.pt/Estatisticas/RelatoriosDeSinistralidade/Documents/2021/Relat%C3%B3rio%20Anual%20de%20Sinistralidade%20a%2030%20dias,%20fiscaliza%C3%A7%C3%A3o%20e%20contraordena%C3%A7%C3%B5es%20rodovi%C3%A1rias%202021.pdf>
- Autoridade Nacional de Segurança Rodoviária - ANSR (2022). Resultados síntese de sinistralidade 2022 (vítimas a 30 dias). Unidade de Prevenção e Segurança Rodoviária, divisão de Observatório de Segurança Rodoviária. <http://www.ansr.pt/Estatisticas/RelatoriosDeSinistralidade/Documents/2022/Relat%C3%B3rio%20Anual%20S%C3%ADntese%20de%20Sinistralidade%20a%2030%20dias%202022.pdf>
- Autoridade Nacional de Segurança Rodoviária - ANSR (2023). Relatório Novembro 2023. Unidade de Prevenção e Segurança Rodoviária, divisão de Observatório de Segurança Rodoviária. <http://www.ansr.pt/Estatisticas/RelatoriosDeSinistralidade/Documents/2023/Relat%C3%B3rio%20de%20Sinistralidade%20a%2024%20horas%20e%20fiscaliza%C3%A7%C3%A3o%20rodovi%C3%A1ria%20novembro%20de%202023.pdf>
- Bachoo, S., Bhagwanjee, A., & Govender, K. (2013). The influence of anger, impulsivity, sensation seeking and driver attitudes on risky driving behaviour among post-graduate university students in Durban, South Africa. *Accident Analysis & Prevention, 55*, 67-76. <https://doi.org/10.1016/j.aap.2013.02.021>
- Benfield, J. A., Szlemko, W. J., & Bell, P. A. (2007). Driver personality and anthropomorphic attributions of vehicle personality relate to reported aggressive driving tendencies. *Personality and Individual Differences, 42*(2), 247-258. <https://doi.org/10.1016/j.paid.2006.06.016>
- Bıçaksız, P., & Özkan, T. (2016). Impulsivity and driver behaviors, offences and accident involvement: A systematic review. *Transportation research part F: traffic psychology and behaviour, 38*, 194-223. <https://doi.org/10.1016/j.trf.2015.06.001>
- Costa, P. T., & McCrae, R. R. (1992). Revised NEO personality inventory (NEO-PI-R) and NEO five factor inventory

- (NEO-FF-I) professional manual. Psychological Assessment Resources.
- Dahlen, E. R., Edwards, B. D., Tubré, T., Zyphur, M. J., & Warren, C. R. (2012). Taking a look behind the wheel: An investigation into the personality predictors of aggressive driving. *Accident Analysis & Prevention*, 45, 1-9. <https://doi.org/10.1016/j.aap.2011.11.012>
- Dahlen, E. R., & White, R. P. (2006). The Big Five factors, sensation seeking, and driving anger in the prediction of unsafe driving. *Personality and individual differences*, 41(5), 903-915. <https://doi.org/10.1016/j.paid.2006.03.016>
- de Winter, J. C., & Dodou, D. (2010). The Driver Behaviour Questionnaire as a predictor of accidents: A meta-analysis. *Journal of safety research*, 41(6), 463-470. <https://doi.org/10.1016/j.jsr.2010.10.007>
- Deffenbacher, J. L., Oetting, E. R., & Lynch, R. S. (1994). Development of a Driving Anger Scale. *Psychological Reports*, 74(1), 83-91. <https://doi.org/10.2466/pr0.1994.74.1.83>
- Eysenck, S. B., & Eysenck, H. J. (1977). The place of impulsiveness in a dimensional system of personality description. *British Journal of Social and Clinical Psychology*, 16(1), 57-68. <https://doi.org/10.1111/j.2044-8260.1977.tb01003.x>
- Eysenck, S.B., Eysenck, H.J., & Barrett, P.T. (1985). A revised version of the Psychoticism scale. *Personality and Individual Differences*, 6, 21-29. [https://doi.org/10.1016/0191-8869\(85\)90026-1](https://doi.org/10.1016/0191-8869(85)90026-1)
- Francis, L. J. (1961). The dual nature of the EPQ lie scale among college students in England. *Personality and Individual Differences*, 12(12), 1255-1260. [https://doi.org/10.1016/0191-8869\(91\)90197-J](https://doi.org/10.1016/0191-8869(91)90197-J)
- Furnham, A., & Saipe, J. (1993). Personality correlates of convicted drivers. *Personality and individual differences*, 14(2), 329-336. [https://doi.org/10.1016/0191-8869\(93\)90131-L](https://doi.org/10.1016/0191-8869(93)90131-L)
- Găianu, P. A., Giosan, C., & Sârbescu, P. (2020). From trait anger to aggressive violations in road traffic. *Transportation research part F: traffic psychology and behaviour*, 70, 15-24. <https://doi.org/10.1016/j.trf.2020.02.006>
- González-Iglesias, B., Gómez-Fraguela, J. A., & Luengo-Martín, M. Á. (2012). Driving anger and traffic violations: Gender differences. *Transportation research part F: traffic psychology and behaviour*, 15(4), 404-412. <https://doi.org/10.1016/j.trf.2012.03.002>
- Hayes, A. (2017). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach (2nd ed.). Guilford Press.
- Harris, P. B., Houston, J. M., Vazquez, J. A., Smither, J. A., Harms, A., Dahlke, J. A., & Sachau, D. A. (2014). The Prosocial and Aggressive Driving Inventory (PADI): A self-report measure of safe and unsafe driving behaviors. *Accident Analysis & Prevention*, 72, 1-8. <https://doi.org/10.1016/j.aap.2014.05.023>
- Herrero-Fernández, D., Parada-Fernández, P., Rodríguez-Arcos, I., Brito, J., & Rodríguez, C. L. (2024). The mediation effect of emotion dysregulation in the relationship between stress and aggression on the road. *European Review of Applied Psychology*, 74(4), 100980. <https://doi.org/10.1016/j.erap.2024.100980>
- Houston, J. M., Harris, P. B., & Norman, M. (2003). The Aggressive Driving Behavior Scale: Developing a Self-Report Measure of Unsafe Driving Practices. *North American Journal of Psychology*, 5(2), 269-278.
- Joint, M. (1995). Road rage. The Automobile Association Group Policy Road Safety Unit.
- Jonah, B. A. (1997). Sensation seeking and risky driving: a review and synthesis of the literature. *Accident Analysis & Prevention*, 29(5), 651-665. [https://doi.org/10.1016/S0001-4575\(97\)00017-1](https://doi.org/10.1016/S0001-4575(97)00017-1)
- Jovanović, D., Lipovac, K., Stanojević, P., & Stanojević, D. (2011). The effects of personality traits on driving-related anger and aggressive behaviour in traffic among Serbian drivers. *Transportation Research Part F: Traffic Psychology and Behaviour*, 14(1), 43-53. <https://doi.org/10.1016/j.trf.2010.09.005>
- King, Y., & Parker, D. (2008). Driving violations, aggression and perceived consensus. *European Review of Applied Psychology*, 58(1), 43-49. <https://doi.org/10.1016/j.erap.2006.05.001>

- Krahé, B. (2005). Predictors of women's aggressive driving behavior. *Aggressive Behavior: Official Journal of the International Society for Research on Aggression*, 31(6), 537-546. <https://doi.org/10.1002/ab.20070>
- Lancaster, R., & Ward, R. (2002). The contribution of individual factors to driving behaviour: Implications for managing work-related road safety. HM Stationery Office.
- Lawton, R., Parker, D., Manstead, A. S., & Stradling, S. G. (1997). The role of affect in predicting social behaviors: The case of road traffic violations. *Journal of Applied Social Psychology*, 27(14), 1258-1276. <https://doi.org/10.1111/j.1559-1816.1997.tb01805.x>
- Lev, D., Hershkovitz, E., & Yechiam, E. (2008). Decision making and personality in traffic offenders: A study of Israeli drivers. *Accident Analysis & Prevention*, 40(1), 223-230. <https://doi.org/10.1016/j.aap.2007.05.009>
- Liu, X. K., Chen, S. L., Huang, D. L., Jiang, Z. S., Jiang, Y. T., Liang, L. J., & Qin, L. L. (2022). The influence of personality and demographic characteristics on aggressive driving behaviors in eastern Chinese drivers. *Psychology Research and Behavior Management*, 15, 193. <https://doi.org/10.2147/PRBM.S323431>
- Magaña, V. C., Pañeda, X. G., Garcia, R., Paiva, S., & Pozueco, L. (2021). Beside and behind the wheel: Factors that influence driving stress and driving behavior. *Sustainability*, 13(9), 4775. <https://doi.org/10.3390/su13094775>
- Parker, D., Reason, J. T., Manstead, A. S., & Stradling, S. G. (1995). Driving errors, driving violations and accident involvement. *Ergonomics*, 38(5), 1036-1048. <https://doi.org/10.1080/00140139508925170>
- Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt impulsiveness scale. *Journal of Clinical Psychology*, 51(6), 768-774. [https://doi.org/10.1002/1097-4679\(199511\)51:6<768::AID-JCLP2270510607>3.0.CO;2-1](https://doi.org/10.1002/1097-4679(199511)51:6<768::AID-JCLP2270510607>3.0.CO;2-1)
- Philippe, F. L., Vallerand, R. J., Richer, I., Vallieres, É., & Bergeron, J. (2009). Passion for driving and aggressive driving behavior: A look at their relationship. *Journal of Applied Social Psychology*, 39(12), 3020-3043. <https://doi.org/10.1111/j.1559-1816.2009.00559.x>
- Reason, J., Manstead, A., Stradling, S., Baxter, J., & Campbell, K. (1990). Errors and violations on the roads: a real distinction? *Ergonomics*, 33(10-11), 1315-1332. <https://doi.org/10.1080/00140139008925335>
- Renner, W., & Anderle, F. G. (2000). Venturesomeness and extraversion as correlates of juvenile drivers' traffic violations. *Accident Analysis & Prevention*, 32(5), 673-678. [https://doi.org/10.1016/S0001-4575\(99\)00103-7](https://doi.org/10.1016/S0001-4575(99)00103-7)
- Richer, I., & Bergeron, J. (2012). Differentiating risky and aggressive driving: Further support of the internal validity of the Dula Dangerous Driving Index. *Accident Analysis & Prevention*, 45, 620-627. <https://doi.org/10.1016/j.aap.2011.09.014>
- Shi, J., Bai, Y., Ying, X., & Atchley, P. (2010). Aberrant driving behaviors: A study of drivers in Beijing. *Accident Analysis & Prevention*, 42(4), 1031-1040. <https://doi.org/10.1016/j.aap.2009.12.010>
- Tao, D., Zhang, R., & Qu, X. (2017). The role of personality traits and driving experience in self-reported risky driving behaviors and accident risk among Chinese drivers. *Accident Analysis & Prevention*, 99, 228-235. <https://doi.org/10.1016/j.aap.2016.12.009>
- Vallerand, R. J. (2008). On the psychology of passion: In search of what makes people's lives most worth living. *Canadian Psychology / Psychologie canadienne*, 49(1), 1-13. <https://doi.org/10.1037/0708-5591.49.1.1>
- Vallerand, R. J., Blanchard, C., Mageau, G. A., Koestner, R., Ratelle, C., Léonard, M., Gagne, M., & Marsolais, J. (2003). Les passions de l'âme: on obsessive and harmonious passion. *Journal of Personality and Social Psychology*, 85(4), 756-767. <https://doi.org/10.1037/0022-3514.85.4.756>
- van den Berg, T. G., Kroesen, M., & Chorus, C. G. (2020). Does morality predict aggressive driving? A conceptual analysis and exploratory empirical investigation. *Transportation Research Part F: Traffic Psychology and Behaviour*, 74, 259-271. <https://doi.org/10.1016/j.trf.2020.08.017>

- Wang, X., Huang, K., & Yang, L. (2019). Effects of socio-demographic, personality and mental health factors on traffic violations in Chinese bus drivers. *Psychology, Health & Medicine*, 24(7), 890-900. <https://doi.org/10.1080/13548506.2019.1567928>
- Whiteside, S. P., & Lynam, D. R. (2001). The five factor model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences*, 30(4), 669-689. [https://doi.org/10.1016/S0191-8869\(00\)00064-7](https://doi.org/10.1016/S0191-8869(00)00064-7)
- WHO (2018). Global status report on road safety. Retrieved from https://www.who.int/violence_injury_prevention/road_safety_status/2018/en/
- Xie, C. Q., & Parker, D. (2002). A social psychological approach to driving violations in two Chinese cities. *Transportation Research Part F: Traffic Psychology and Behaviour*, 5(4), 293-308. [https://doi.org/10.1016/S1369-8478\(02\)00034-7](https://doi.org/10.1016/S1369-8478(02)00034-7)
- Zhang, X., Qu, X., Tao, D., & Xue, H. (2019). The association between sensation seeking and driving outcomes: a systematic review and meta-analysis. *Accident Analysis & Prevention*, 123, 222-234. <https://doi.org/10.1016/j.aap.2018.11.023>
- Zuckerman, M. (1994). *Behavior expressions and biosocial bases of sensation seeking*. Press Syndicate of the University of Cambridge.

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