

## Article

# Cognitive and Motivational Antecedents of Different Driving Styles in a Sample of Lithuanian Drivers

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**Abstract:** The aim of this study was to assess whether road risk, road hazard perception skills, and attitudes towards risky driving are significant psychological antecedents of different driving styles. The study sample consisted of 446 non-professional drivers (with an average age of 32.6 years) and 200 professional drivers (with an average age of 47.7 years) from Lithuania. The study questionnaire included demographic questions, a multidimensional driving style assessment, a Lithuanian version of a hazard prediction test, a risk perception scale, and a subjective evaluation of driving competence (perceptual, motor, and safety driving skills), as well as an evaluation of attitudes towards risky driving. The results confirmed that cognitive factors, together with attitudes towards driving and demographic factors, are important for understanding the origins of different driving styles. Cognitive factors like hazard perception and risk perception skills were found to be significant predictors of anxious, careless, and angry driving styles, mainly for professional drivers. Attitudes towards risky driving together with demographic characteristics and cognitive factors were found to be important in predicting anxious, careless, and angry driving styles among professional as well as non-professional drivers. The subjective evaluation of driving competence (driving skills) was found to be crucial in predicting all four driving styles, but only in the non-professional drivers sample.

**Keywords:** different driving styles; road hazard perception; road risk perception; attitudes towards risky driving



**Citation:** Slavinskienė, J.; Endriulaitienė, A. Cognitive and Motivational Antecedents of Different Driving Styles in a Sample of Lithuanian Drivers. *Safety* **2024**, *10*, 27. <https://doi.org/10.3390/safety10010027>

Academic Editor: Raphael Grzebieta

Received: 12 November 2023

Revised: 1 March 2024

Accepted: 6 March 2024

Published: 13 March 2024



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## 1. Introduction

In recent years, there has been a growing interest in understanding the impact of human behavior on traffic crashes, particularly within the broader context of habitual driving behaviors, and much analysis has been conducted to this effect. Among driving-related factors underlying crash risk, driving style has been recognized as one of the most important factors [1]. Driving style refers to the typical behavioral pattern of drivers, including driving speed, headway, compliance with traffic rules, and habitual levels of attentiveness [2]. Therefore, psychological antecedents of different driving styles remain relevant in the traffic psychology field.

In 2004, Taubman-Ben-Ari and a team introduced a multidimensional model of four driving styles. According to the authors, a safe, or in the authors' terms, careful and patient, driving style is characterized by drivers who easily adapt to various traffic situations and are patient while driving. These drivers possess the ability to focus on driving and scan traffic efficiently. They are capable of planning their actions appropriately and anticipating the actions of other road users. They exhibit polite and courteous behavior while driving, and they are known for their calm, quick, precise, and adequate reactions while driving [3,4]. The reckless driving style describes drivers who engage in risky behaviors while driving, such as deliberate lane-changing in prohibited areas, racing with other drivers, frequently crossing solid lane markings, or running red traffic lights. These actions provide them with a sense of excitement [3,4]. These drivers do not adhere to traffic regulations, and

usually violate road traffic rules [5,6]. The aggressive driving style characterizes impatient drivers who tend to express hostility and disrespect towards other road users, regardless of traffic intensity or the group of road users (e.g., pedestrians are shouted at while crossing the road during a green light for them) [3,4]. These are drivers who frequently experience anger while driving and convey their irritation, dissent with the actions of other drivers, and non-compliance with road and social rules through gestures, words, and actions. They particularly enjoy competing with other drivers [5,6]. The anxious driving style is associated with drivers who experience high levels of anxiety, insecurity, and internal tension while driving. They often lack confidence in their decisions and hesitate to perform necessary driving actions [3,4]. Although these drivers remain consistently vigilant and focused on observing traffic flow, they struggle to make quick decisions (e.g., merging into a roundabout) or perform highly precise actions (e.g., parallel parking) due to their lack of confidence in their driving skills and competencies [5,6]. Thus, the concept of driving styles introduced in 2004 continues to be analyzed in various countries around the world. The four-factor model of driving styles has been confirmed in diverse cultural and traffic settings [6]. Nevertheless, comparative analyses of driving styles among drivers with different driving experiences, even in international studies, remain relatively rare. Therefore, the main subject of this study revolves around different driving styles among professional and non-professional drivers.

Driving styles have been found to be dependent on driving experience and driving competence. Usually, professional drivers undergo specialized training that results in well-developed driving skills and higher driving competence [5]. Professional drivers may be exposed to different levels and types of risks while driving compared to non-professionals [7]. These differences could be related to different ways of habitual driving (or in other words, driving styles) and may require the employment of different strategies to enhance safe driving. Therefore, analysis of the psychological antecedents of driving styles among professional and non-professional driver groups was essential in this study.

Other demographic characteristics were also found to be significant in understanding the origins of driving styles. Previous studies have indicated that younger drivers with less driving experience and those who drive less frequently often exhibit an anxious driving style [2,6]. Studies reveal that the anxious driving style is more commonly observed among female drivers than among male drivers [8]. On the other hand, younger drivers who frequently cover long distances are more likely to develop a reckless driving style, and this tendency is more pronounced in men than in women [2,3]. A greater association with an aggressive driving style is linked to higher levels of driving experience and male drivers [3,9]. Driving competence and self-evaluation of driving skills also play an important role in the determination of driving styles. Better evaluation of driving skills has been found to be significantly related to reckless and angry driving styles [4].

Most researchers agree that different driving styles are influenced by psychological characteristics, mainly by personal habits, attitudes, evaluation of driving skills, and some cognitive characteristics [5,6,10,11]. Recent studies have revealed that cognitive abilities, such as perception of various aspects of driving, like road related risk and hazards, are the most crucial factors directly linked to driving quality and habitual driving behavior, and thus to driving styles [12]. It is worthwhile to note that in this study, hazard prediction skills and hazard perception skills are used as synonyms [12]. Previous research has indicated that a safe driving style is significantly associated with better risk perception skills on the road, while reckless, aggressive, and anxious driving styles are more closely linked to poorer risk perception skills [3,13,14]. Drivers who exhibit a safe driving style tend to focus their attention and shift their concentration effectively when observing traffic flow and potential risk-inducing stimuli. They are more alert and respond with greater responsibility and patience to perceived risky stimuli or situations [3], thus enabling them to respond more successfully to any hazards on the road [15,16]. Analysis of road hazards and driving styles has revealed that a safe driving style is associated with better hazard perception skills, whereas a reckless driving style is linked to poorer hazard perception skills [11].

The associations between aggressive and anxious driving styles and hazard perception skills have not been established. Thus, researchers have emphasized the need for a broader and deeper examination of these relationships, especially within different driver groups. Therefore, this study will examine the assumption that risk perception skills as well as hazard perception skills are significantly associated with different driving styles.

Finally, most studies have concluded that risky, dangerous, reckless or other type of driver behavior on the road are influenced by beliefs or attitudes towards driving [17,18]. The term beliefs or attitudes in this context refer to a person's subjective assessment, based on knowledge and individual experience, forming their personal opinions. Both of these terms describe the subjective evaluation of how positive/negative, desirable/undesirable, and acceptable/unacceptable a particular driving style and its outcomes are [18]. Additionally, a driver's attitude towards risky driving is recognized as one of the key factors in analyzing their decision-making while driving [19]. The analysis of attitudes towards driving allow a greater understanding of the beliefs that motivate drivers to drive in a certain way consistently and habitually and thus develop a particular driving style [20]. Studied have confirmed that the more favorable a driver's attitudes towards risky behavior on the road are, the more likely they are to choose a more reckless, and sometimes even aggressive, driving style [21]. On the other hand, less favorable attitudes towards risky actions while driving are associated with both safer driving styles and a general contribution to safety while participating in traffic [21]. In this study, there is an assumption that attitudes toward risky driving will be significantly related to driving styles for both driver groups. We have assumed that attitudes toward risky driving remain significant in a broader analysis, taking into account cognitive characteristics and driving experience and competence.

In sum, previous studies have confirmed that demographic characteristics, cognitive factors, and motivational aspects, such as attitudes towards driving, are significant in determining driving styles. However, there is one limitation to these studies. All reported studies investigated the significance of cognitive, motivational, or demographic characteristics for different driving styles individually. Therefore, it is not clear whether hazard perception or risk perception skills remains significant when taking into account attitudes towards driving. Thus, the aim of this study is to assess whether road risk, road hazard perception skills, and attitudes towards risky driving are significant psychological antecedents of different driving styles.

## 2. Materials and Methods

### 2.1. Study Sample

The total sample in this study comprised 646 drivers from Lithuania, including 446 non-professional drivers and 200 professional drivers (holding a D (D1) category for professional driving and/or individuals whose primary job function is directly related to driving, e.g., truck drivers, taxi drivers etc.).

The majority of the 446 non-professional drivers were female (74.4%), while the majority (71%) of professional drivers were male. The average age of the non-professional driver group was 32.6 years (SD = 11.6 years), while the average age of the professional driver group was 47.7 years (SD = 10.2 years). Comparative analysis revealed that professional drivers were significantly older than non-professional drivers (Student's  $t = -1.423$ ,  $p = 0.002$ ). The average number of years of driving experience among non-professional drivers was 11.6 years (SD = 10.4 years), while for professional drivers, it was 16.9 years (SD = 10.9 years). Professional drivers had significantly more driving experience than non-professional drivers (Student's  $t = -3.236$ ,  $p = 0.001$ ). Further analysis of the participants' driving experience revealed that 63.9% of non-professional and 86.6% of professional drivers reported driving daily. Approximately 54% of non-professional drivers and 51.2% of professional drivers reported driving an average of 101 to 500 km per week. Notably, only a small fraction (5.4%) of non-professional drivers and a third (37.8%) of professional drivers reported driving an average of 500 km or more per week. Approximately 77% of non-professional drivers and the majority (82.9%) of professional drivers stated that

they had not caused any accidents in the past year. Additionally, 70% of non-professional drivers and 52.4% of professional drivers reported not receiving any penalties due to traffic violations in the most recent year.

The vast majority (79.7%) of professional drivers indicated that, usually, for work as a professional driver, they drove a car, while 7.2% drove a heavy truck, 7.3% operated a passenger bus, and 5.8% drove a cargo bus. Half of the professional drivers (58%) mentioned that they drive within urban areas, 34.8% travel on intercity roads within Lithuania, and 7.2% of professional drivers work on international roads. The vast majority (89.9%) of professional drivers worked on a stable schedule. The participants in the study who were professional drivers had work experience ranging from six months to 25 years, with an average of 3.3 years (SD = 4.7 years). Professional drivers stated that their average working hours were approximately 17.6 h (SD = 2.1 h).

## 2.2. Research Instruments

The study employed an online self-report questionnaire. Participants were asked demographic questions about their gender, age, education, driving experience, and specific aspects of driving (accidents caused, involvement in accidents, driving frequency, etc.). The Lithuanian Hazard Prediction Test [22] was used to evaluate hazard perception skills. This newly developed Lithuanian questionnaire consists of 12 short video clips featuring real-life traffic situations in Vilnius and Kaunas city and rural areas, filmed from the driver's perspective and capturing actual hazards. After each video clip, participants were asked to answer the question "what happens next?" and had to select one of four options (where only one answer of the four was correct). Each correct answer allowed for an assessment of the participant's ability to accurately perceive the traffic situation and recognize the hazards. A higher score indicated better hazard perception skills. In a previous study, the newly developed test was found to be reliable and valid for Lithuanian novice and experienced drivers; a low but satisfactory internal reliability was found (Cronbach's  $\alpha$  of 0.54), similarly to in this study (Cronbach's  $\alpha$  of 0.57).

Participants were also asked to complete a self-report Risk Perception Scale [23]. This scale consisted of 34 items describing various traffic situations (e.g., driving in rural areas at night at a speed of 110 km/h, answering an important phone call while driving without a hands-free device, etc.). Participants were asked to rate how risky each situation seemed to them as drivers by selecting responses on a Likert scale ranging from 1 (completely non-risky) to 5 (extremely risky). A higher score indicated better risk perception on the road [23]. The authors of the scale consider it reliable for group studies [23]. In this study, a high reliability was achieved (Cronbach's  $\alpha$  of 0.91).

An attitudes towards risky driving questionnaire [24] was used to evaluate motivational characteristics significantly related to driving. The 16-item questionnaire was used to assess attitudes towards speeding and traffic rule violations, attitudes towards the risky driving of other drivers, and attitudes towards driving under the influence of alcohol. The authors of this questionnaire suggested the use of either a general score or separate scales, and a general score was used in this study. Responses to the questionnaire were rated on a five-point Likert scale. A higher overall score indicated a more favorable attitude towards risky driving. Previous studies in Lithuania using this questionnaire have indicated that this instrument is reliable and valid [25–27]. Accordingly, a high internal reliability (Cronbach's  $\alpha$  of 0.83) was found in this study.

Lastly, the Multidimensional Driving Style Inventory [3] was used to assess four different driving styles, characterizing drivers' typical behavior and decision-making related to driving. This questionnaire was comprised of 44 items, allowing the evaluation of four driving styles: (a) reckless driving style, describing drivers who consciously make risky decisions while driving, seeking sensation and excitement; (b) anxious driving style, describing drivers who feel unsure about their driving and who struggle to make quick and appropriate decisions in an extreme driving situations, as well as perceiving any unexpected driving action as unsafe, causing fear; (c) aggressive driving style, describing

drivers who express disrespect and hostility towards other road users in an active and/or passive way; (d) safe (careful and patient) driving style, describing drivers who tend to behave safely towards themselves and other road users, respect traffic rules, and make appropriate decisions to avoid traffic incidents. Responses to the questionnaire items were rated on a five-point Likert scale. The authors of the questionnaire implemented factor analysis and suggested four factor model where each driving style is characterized by a unique combination of questionnaire items [4]. The same four-factor model and description of four different driving styles were investigated in this study. Higher scores indicated a more pronounced inclination towards each driving style. Each participant received scores for all four driving styles. The driving style attributed to each driver was determined based on the highest scores among the four. Previous research has considered this questionnaire suitable for group studies, with sufficient internal consistency reported in different questionnaire scales, ranging from 0.72 to 0.86 [3]. In this study, a satisfactory internal consistency was achieved (Cronbach's  $\alpha$  ranging from 0.64 to 0.79).

### 2.3. Procedure

The study was conducted from January 2022 to February 2023. Ethical approval for the study was obtained from the Ethics Committee of Vytautas Magnus University, Department of Psychology (Approval No. EKP-2021.05). The study was conducted using an online platform at <https://postdok.lt/> (accessed until 31 August 2023). Each participant was asked to familiarize themselves with an informed consent form before answering any questions. The form detailed the study's purpose, duration, principles of confidentiality and anonymity, and information regarding data usage. Only participants who read and agreed to the informed consent were allowed to proceed further and were then asked to answer demographic characteristic related questions. Only participants aged 18 years or older who indicated driving at least once a month could fill out the entire questionnaire. Recruitment was carried out through various social media channels and advertising messages. Professional drivers were invited to participate through the organizations where they work as professional drivers.

### 2.4. Data Analysis Methods

Data collected during the study were processed using IBM SPSS Statistics software, version 23. After assessing the normality of distributions using the Shapiro-Wilk test and examining skewness and kurtosis coefficients, it was determined that for three out of the four driving styles, risk perception, hazard perception, attitudes toward risky driving and driving skills scale distributions were close to normal, with skewness and kurtosis coefficients falling within the range of  $-1$  to  $1$ . Only the aggression scale had slightly higher skewness (1.143) and kurtosis (1.437) coefficients. After excluding three univariate outliers from the data analysis, skewness and kurtosis coefficients did not exceed the specified limits, enabling the use of parametric statistical tests for data analysis. Parametric Student's *t*-tests were employed for comparing age and driving experience between professional and non-professional driver groups. Hierarchical linear regression analysis (with an enter method) was used for the main analysis, with each of the driving styles predicted separately in two different sample groups.

## 3. Results

The aim of this study was to assess whether road risk as well as road hazard perception skills and attitudes towards risky driving are significant psychological antecedents of different driving styles. To address this aim, a hierarchical linear regression analysis was performed. Four models, one for each driving style, were formed. The explanatory power ( $R^2$  and  $\Delta R^2$ ) of the models, as well as model statistical significance, were assessed. Driving style (reckless, aggressive, anxious, or safe) was a dependent variable. Independent variables were strategically added to the model step by step based on the nature of the variables. Specifically, the strategy was based on the conceptual framework established in

the literature review and the research objectives. Thus, based on the theoretical model, the following steps were determined regarding independent variables. (1) Demographic factors related to driving: for both groups, this included gender, driving experience, frequency of driving, and the average number of kilometers driven per week. For professional drivers only, experience, the average number of hours worked per week, and the type of driving route (urban roads, suburban roads, international routes) were considered. Driver age was initially included in this block but was subsequently excluded due to a high multicollinearity index (strong associations with the driving experience variable). (2) Road hazard perception skills, as one cognitive factor, was added in the second step. (3) Road risk perception skills, as the second cognitive factor, was added in third step. (4) The assessed motivational driving factor, attitudes towards risky driving, was added to the final model. Results were analyzed using standardized regression coefficients, the model’s explanatory  $R^2$ , the model’s F coefficient, and the changes in its statistical significance. The statistical significance level was set at  $\alpha = 0.05$ . Results are presented in Table 1 for the non-professional drivers sample and in Table 2 for the professional drivers sample.

**Table 1.** The figures in the columns represent the standardized regression coefficients of the hierarchical regression analysis of driving styles in the non-professional driver group (N = 446).

	Different Driving Styles			
	Reckless	Aggressive	Anxious	Safe
1 step:				
Gender	−0.10	0.03	0.08	−0.06
Driving experience (in years)	0.08	0.14 *	0.16 *	0.04
Frequency of driving	0.22 *	0.17 *	−0.19 *	−0.15 *
Mean of driven km per week	0.05	0.04	−0.19 *	0.09
$R^2$ (%)	10.0	6.7	15.3	2.3
F	10.9	7.0	17.6	2.3
2 step:				
Gender	−0.10	0.04	0.08	−0.05
Driving experience (in years)	0.08	0.15 *	0.15 *	0.04
Frequency of driving	0.22 *	0.17 *	−0.19 *	−0.15 *
Mean of driven km per week	0.05	0.04	−0.19 *	0.09
Hazard perception skills	−0.002	0.04	−0.03	0.03
$R^2$ (%)	10.0	6.9	15.4	2.4
$\Delta R^2$	0.000	0.1	0.1	0.1
$\Delta F$	0.003	0.59	0.36	0.39
3 step:				
Gender	−0.05	0.09	0.04	−0.06
Driving experience (in years)	0.13 *	0.20 *	0.12 *	0.04
Frequency of driving	0.22 *	0.17 *	−0.18 *	−0.14 *
Mean of driven km per week	0.03	0.02	−0.07	0.09
Hazard perception skills	0.02	0.07	−0.05	0.03
Risk perception skills	−0.25 *	−0.24 *	0.16 *	0.04
$R^2$ (%)	15.6	12.1	17.7	2.5
$\Delta R^2$	5.6	5.3	2.3	0.1
$\Delta F$	25.5 *	23.3 *	11.1 *	0.48

Table 1. Cont.

	Different Driving Styles			
	Reckless	Aggressive	Anxious	Safe
4 step:				
Gender	0.01	0.04	0.06	−0.09
Driving experience (in years)	0.19 *	0.24 *	0.13 *	0.01
Frequency of driving	0.17 *	0.14 *	−0.19 *	−0.13 *
Mean of driven km per week	0.05	0.03	−0.17 *	0.09
Hazard perception skills	0.05	0.09	−0.04	0.02
Risk perception skills	−0.09 *	−0.13 *	0.19 *	−0.03
Attitudes towards risky driving	0.48 *	0.35 *	0.11 *	−0.21 *
R <sup>2</sup> (%)	35.4	22.3	18.8	6.3
ΔR <sup>2</sup>	19.8	10.2	1.1	3.8
ΔF	118.5 *	50.9 *	5.0 *	15.7 *

\* Statistical significance level  $\alpha = 0.05$ .

**Table 2.** The figures in the columns represent the standardized regression coefficients of the hierarchical regression analysis of driving styles in the professional driver group (N = 200).

	Reckless	Aggressive	Anxious
1 step:			
Gender	0.04	0.03	0.04
Driving experience (in years)	0.04	0.01	0.11
Frequency of driving	0.36 *	0.25 *	−0.12
Mean of driven km per week	0.14	0.13 *	−0.03
Driving experience working as professional driver	−0.34 *	−0.29	−0.25 *
Mean working hours per week	−0.005	0.19	−0.29 *
Driving route	−0.13	−0.13	0.14
R <sup>2</sup> (%)	14.5	22.0	37.7
F	2.50	2.2	4.7
2 step:			
Gender	0.04	0.04	0.02
Driving experience (in years)	0.05	0.001	0.09
Frequency of driving	0.36 *	0.24 *	−0.13
Mean of driven km per week	0.12	0.18	0.03
Driving experience working as professional driver	−0.34 *	−0.29 *	−0.26 *
Mean working hours per week	−0.02	0.23	−0.25 *
Driving route	−0.12	−0.15	0.11
Hazard perception skills	0.06	−0.15	−0.16
R <sup>2</sup> (%)	13.3	23.7	39.6
ΔR <sup>2</sup>	0.003	0.02	0.02
ΔF	0.19	1.17	1.76

Table 2. Cont.

	Reckless	Aggressive	Anxious
3 step:			
Gender	0.07	0.03	0.09
Driving experience (in years)	−0.01	−0.01	−0.02
Frequency of driving	0.37 *	0.24 *	−0.13
Mean of driven km per week	0.19	0.19	0.16
Driving experience working as professional driver	−0.33 *	−0.29 *	−0.24 *
Mean working hours per week	−0.10	0.21	−0.41 *
Driving route	−0.11	−0.15	0.12
Hazard perception skills	0.05	−0.15	−0.18
Risk perception skills	0.20	0.04	0.38 *
R <sup>2</sup> (%)	14.5	10.8	48.3
ΔR <sup>2</sup>	0.02	0.001	0.08
ΔF	1.80	0.06	8.83 *
4 step:			
Gender	0.03	0.04	0.09
Driving experience (in years)	0.02	0.02	−0.02
Frequency of driving	0.24 *	0.21 *	−0.14
Mean of driven km per week	0.39 *	0.34 *	0.18
Driving experience working as professional driver	−0.09	−0.05	−0.22
Mean working hours per week	−0.26 *	0.05	−0.42 *
Driving route	−0.03	−0.07	0.12
Hazard perception skills	−0.09	−0.29 *	−0.19
Risk perception skills	0.37 *	0.21 *	0.39 *
Attitudes towards risky driving	0.68 *	0.70 *	0.05
R <sup>2</sup> (%)	51.8	51.3	48.5
ΔR <sup>2</sup>	32.6	35.4	0.002
ΔF	42.0 *	45.1 *	0.19

\* Statistical significance level  $\alpha = 0.05$ .

Demographic variables (gender, driving experience, frequency of driving, and mean of driven km per week) were entered at step one. However, model one, considering only the demographic variables, resulted in a poor model fit, with none of the demographic variables significantly contributing to any of the four different driving styles. The hazard perception skills variable was entered at step two. This variable did not improve model fit; the model remained non-significant for all four driving styles. The risk perception variable was entered into the model at step three. The resulting model was statistically significant for three different driving styles (except the safe driving style;  $F = 2.7, p > 0.05$ ) and explained 15.6% of the variance in the reckless driving style, 12.1% in the aggressive driving style, and 17.7% in the anxious driving style. After the authors entered attitudes towards risky driving at step four, the total variance the model explained as a whole was 35.4% for the reckless driving style ( $F = 30.3, p > 0.0001$ ), 22.3% for the aggressive driving style ( $F = 15.9, p > 0.0001$ ) and 18.8% for the anxious driving style ( $F = 12.77, p > 0.0001$ ). The model for the safe driving style reached statistical significance only at step four (when attitudes towards risky driving was added). All variables explained 6.3% of the model for safe driving style.

Poor risk perception skills, more favorable attitudes towards risky driving, greater driving experience, and frequent driving (on a daily basis) made a significant contribution to explaining reckless and aggressive driving styles in the non-professional drivers group. It was found that greater driving experience, frequent driving (on a daily basis), less mileage per week, more favorable attitudes towards risky driving, and poorer risk perception skills were significant variables in explaining the prevalence of an anxious driving style among non-professional drivers. Less favorable attitudes towards risky driving and less regular driving were significant variables for explaining safe driving in the non-professional drivers sample. Gender, mean of driven km per week, and hazard perception variables were not significant at any step for all four models in the non-professional drivers sample.

To determine whether cognitive factors, attitudes, and demographic characteristics are significant antecedents of the driving styles of professional drivers, a prognostic analysis was conducted (see Table 2). The model for safe driving was not significant ( $F = 1.58$ ,  $p = 0.14$ ), and thus, results could not be interpreted.

Demographic variables (gender, driving experience, frequency of driving, mean of driven km per week, driving experience working as professional driver, mean working hours per week, and driving route) for professional drivers were entered at step one. However, model one, with only the demographic variables, resulted in a poor model fit; none of the demographic variables significantly contributed to any of the three different driving styles. The hazard perception skills variable was entered at step two. This variable did not improve model fit, and the model remained non-significant for all driving styles in the professional drivers sample. The risk perception variable was added to the model at step three. This model was statistically significant only for the anxious driving style ( $F = 5.49$ ,  $p > 0.001$ ) and explained 48.3% of the variance in the anxious driving style. After the authors entered attitudes towards risky driving at step four, the total variance the model explained as a whole was 51.8% for the reckless driving style ( $F = 7.66$ ,  $p > 0.0001$ ) and 51.3% of the variance for the aggressive driving style ( $F = 7.54$ ,  $p > 0.0001$ ). The model became non-significant after entering attitudes towards risky driving in step four ( $\Delta F = 0.192$ ,  $p = 0.66$ ).

Poor risk perception skills, more favorable attitudes towards risky driving, greater driving experience, and frequent driving (on a daily basis) made a significant contribution to explaining reckless and aggressive driving styles in the non-professional drivers group. It was found that greater driving experience, frequent driving (on a daily basis), less mileage per week, more favorable attitudes towards risky driving, and poorer risk perception skills were significant variables in explaining the anxious driving style among non-professional drivers. Less favorable attitudes towards risky driving and less regular driving were significant variables in explaining safe driving in the non-professional drivers sample. Gender, mean of driven km per week, and hazard perception variables were not significant at any step for all four models in the non-professional drivers sample.

The results revealed that more favorable attitudes towards risky driving and better risk perception skills are significant variables for explaining the reckless driving style in the professional drivers group, while controlling for frequent driving and greater mileage per week. Poor hazard prediction skills only together with more favorable attitudes towards risky driving and better risk perception skills were significant variables for explaining an aggressive driving style among professional drivers, while controlling for frequent driving and greater mileage per week. Only better risk perception skills made a significant contribution to explaining anxious driving styles among professional drivers whilst taking into account driving experience working as professional driver and mean working hours per week.

#### 4. Discussion

The aim of this study was to assess whether road risk, road hazard perception skills, and attitudes towards risky driving are significant psychological antecedents of different driving styles. The results from both samples support the assumption that driving ex-

perience and related factors such as mileage and frequency of driving are significant in the development of different driving styles. Perhaps via greater driving experience and greater mileage drivers develop driving skills and are more familiar with different road conditions, traffic patterns, and are more prepared to handle various driving situations in more dangerous ways [28].

This study presents a bit more information regarding the relationship between hazard perception and driving styles. It was found that poor hazard perception skills significantly relate to only an aggressive driving style, and only in the sample of professional drivers. Drivers with poor hazard perception skills may have difficulty recognizing potential dangers on the road promptly [13]. They might fail to notice subtle cues, such as a car suddenly braking ahead, or a pedestrian about to cross the street. This delayed recognition can lead to sudden and unexpected situations that trigger frustration and anger, which were commonly observed in the professional drivers sample [29].

On the one hand, it was found that poorer risk perception skills were significantly associated with the reckless, aggressive, and anxious driving styles in the non-professional drivers sample. This result confirms previous studies, which indicated that drivers who experienced difficulties in understanding risks and underestimated potential consequences typically undergo reckless or even more aggressive driving actions [1,10,23]. It could be assumed that poor risk perception skills may be coupled with a lack of training, which can further contribute to reckless and aggressive driving behaviors. Without the necessary skills to anticipate and respond to potential hazards on the road, drivers may resort to aggressive maneuvers as a coping mechanism. Contrarily, anxious drivers may exhibit hypervigilance, constantly scanning their environment for potential threats or dangers while driving. While this heightened awareness can be beneficial in some situations, it can also lead to a distorted perception of risk, with anxious drivers perceiving hazards where they may not exist or exaggerating the severity of potential dangers [12].

On the other hand, the results of this study showed that greater risk perception was found to be related to reckless, aggressive, and anxious driving styles among professional drivers. This result contradicts previous assumptions that these driving styles have to be related to poorer risk perception skills [3,13,14]. Perhaps this result indicates that successful experience in identifying risk stimuli while driving encourages self-confidence, which is associated with unsafe habitual driving. This assumption is supported by findings that those who have good risk perception skills sometimes prioritize riskier behaviors over safe ones in order to check whether they can deal with risks successfully. Perhaps over time, professional drivers tend to develop a sense of familiarity with their driving tasks while working which leads to the perception that they can handle higher levels of risk safely.

Finally, the results of this study confirmed the results of previous studies regarding the relationship between more favorable attitudes towards risky driving and unsafe driving styles [18]. Results showed that more favorable attitudes were significantly related to reckless, more aggressive, and more anxious (only in non-professionals) driving styles. This means that positive evaluation of risky driving, i.e., treating this behavior as acceptable, enhances the likelihood of drivers repeating risky driving behavior, ultimately leading to long-lasting unsafe habitual decision-making while driving. Additionally, drivers with positive attitudes towards risky driving may perceive reckless or aggressive driving as socially approved behaviors. By taking the risk behind the wheel or driving in an aggressive manner they may believe they are enhancing their social status as leaders or causing fear in others, thus earning them respect amongst their peers [17]. It was quite unexpected that this tendency was found not only in non-professional drivers sample, but in the professional drivers group too.

The presented results of this study imply that:

- (a) Professional drivers could undergo specialized training programs focusing on hazard perception skills to mitigate aggressive driving behavior. These programs could include simulated scenarios that emphasize identifying and appropriately responding to hazards or even risks on the road. Some interventions, based on direct feedback

of skipped risks while driving, could be used as a method to regulate behavioral responses in risky situations [15,30].

- (b) Contrarily, non-professional drivers could benefit from interventions aimed at enhancing risk perception skills. Interventions based on simulated driving with expert feedback could enhance risk perception skills [31,32]. Additionally, an educational campaign highlighting the consequences of reckless and aggressive driving should be implemented in Lithuania.

**Limitations:** This study explores the psychological origin of different driving styles in a more complex way by taking into account cognitive, motivational, and demographic characteristics together. The use of a reasonably large sample allowed the authors to draw more reasonable conclusions. Despite this, there were some limitations. Firstly, the study design was based on a self-report questionnaire. This self-assessment aspect may influence the interpretation of driving styles. Therefore, some experiments, using simulated driving, should be considered as an additional objective source of information. The professional drivers sample was sufficiently mixed: some of them drove trucks, some of them operated cars, and some of them drove a bus. The sample size did not allow the division of professional drivers into smaller groups. Thus, it remains unclear what the primary driving styles of the drivers operating each type of vehicle are. Additionally, the results of the study should be interpreted carefully, taking into account that the majority (74.4%) of the non-professional drivers were female, while the majority (71%) of professional drivers were male. It is worth noting that significant age differences were found in this study. Thus, further studies should aim to collect more data from a non-professional drivers sample made up of more males who are at a similar age. The multidimensional driving style questionnaire gave more information about habitual ways of driving. Based on the original version and author suggestions, four different driving styles were tested in this study. However, previous studies found it to be culturally dependent [6]. Thus, it could be useful to investigate the multidimensional driving styles questionnaire in a more detailed way and to check whether a four-factor solution for this questionnaire is the best for a Lithuanian driver sample.

## 5. Conclusions

The results of this study confirm that one cognitive factor together with attitudes towards driving and some driving experience-related demographic factors are important for understanding the origin of different driving styles. It could be concluded that:

- (1) Risk perception skills are associated with reckless, aggressive, and anxious driving styles among professional and non-professional drivers.
- (2) Attitudes towards risky driving are significant in determining all four of reckless, aggressive, anxious, and safe driving styles among non-professional drivers, but only reckless and aggressive driving styles among professional drivers.
- (3) The driving experience of non-professional drivers, as well as the frequency of driving, mileage per week, and workload of professional drivers should be controlled when analyzing psychological factors associated with different driving styles.

**Author Contributions:** J.S.: Conceptualization, methodology, formal analysis, investigation, data curation, visualization, writing an original draft; A.E.: Conceptualization, supervision, writing—review and editing. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by a grant from the Research Council of Lithuania (No. 09.3.3-lmt-k-712-23-0154).

**Institutional Review Board Statement:** The study was approved by the Ethics Committee of Vytautas Magnus university (No. EKP-2021.05, date of approval 30 December 2021).

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Data are contained within the article.

**Conflicts of Interest:** The authors declare no conflict of interest.

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