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Personality and professional drivers' driving behavior

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ABSTRACT

The driving performance of professional truck drivers was assessed though a driving simulator and correlated with Big Five personality traits, sensation seeking, and present time perspective. The variables measured were speed and lateral position in the lane. The Big Five personality traits were measured by a NEO-FFI questionnaire, sensation seeking by the Brief Sensation Seeking Scale, and the present time perspective by the Zimbardo Time Perspective Inventory. Participants were professional drivers who drove through three scenarios in a truck simulator. Sensation seeking and hedonistic present time perspective were associated with a higher mean speed. Conscientiousness correlated with a lower mean speed. Extraversion and sensation seeking were associated with driving more on the right side of the lane. Relationships identified in previous research on automobile drivers were confirmed for professional truck drivers according to (1) higher speed/higher risky behavior and (2) higher sensation seeking, greater present time perspective, and lower conscientiousness.

1. Introduction

Driving is a complex behavior influenced by many characteristics, such as age, gender, and health. Driving behavior can also be predicted by psychological factors, such as attachment (Gillath, Cantherberry, & Atchley, 2017) and personality traits (Lucidi, Mallia, Lazuras, & Violani, 2014). Personality traits are the stable characteristics of a person and there are established tests to measure these traits. Studying the connection of personality to driving behavior aids in understanding how drivers with certain characteristics might behave in specific traffic situations. Numerous studies have been conducted to research this connection.

People with certain personality characteristics are more likely to be involved in traffic accidents. The number of accidents positively correlates with neuroticism and negatively correlates with agreeableness and conscientiousness (Qu et al., 2015). Yang, Du, Qu, Gong, and Sun (2013) reported that the number of traffic violations is positively correlated with anger, sensation seeking, and normlessness, and negatively correlated with altruism; the number of traffic accidents positively correlates with anger and normlessness, and negatively correlates with altruism.

Personality is related to traffic accidents because drivers with certain personality characteristics drive more dangerously. Risky driving behavior is associated with lower altruism (Chen, 2009; Ge et al., 2014; Ulleberg & Rundmo, 2003), higher sensation seeking (Ge et al., 2014; Oltedal & Rundmo, 2006; Ulleberg & Rundmo, 2003), lower agreeableness and conscientiousness, and higher compulsiveness (Šucha & Černochová, 2016). Higher extraversion, lower agreeableness, and lower

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conscientiousness are associated with reckless and angry driving styles (Taubman-Ben Ari & Yehiel, 2012). Aggressive driving is connected with high neuroticism (Lajunen & Summala, 1995; Qu et al., 2015), low agreeableness (Dahlen, Edwards, Tubré, Zyphur, & Warren, 2012; Qu et al., 2015), and low conscientiousness (Qu et al., 2015). In short, studies of the relationship between driving safety and personality variables have often found a relationship between various types of unsafe driving and low conscientiousness, low agreeableness, and high neuroticism.

The most prominent personality characteristic studied in connection with driving is sensation seeking, which is often found to be related to risky driving activities. Sensation seeking correlates with a higher number of unsafe driving practices and mistakes in driving (Constantinou, Panayiotou, Konstantinou, Loutsiou-Ladd, & Kapardis, 2011). It was found to be connected with aggressive and risky driving by Dahlen, Martin, Ragan, and Kuhlman (2005); to be the strongest predictor of risky driving by Iversen and Rundmo (2002); and to be a predictor of accidents by Dahlen and White (2006). Sensation seeking is also a predictor of risky driving in the majority of studies reviewed by Jonah (1997). Another personality characteristic related to driving is present time perspective — which is a tendency "to rely on the immediate, salient aspects of the stimulus and social setting when making decisions and taking actions" (Zimbardo, Keough, & Boyd, 1997:1008). Zimbardo et al. (1997) found that present time perspective is associated with risky driving.

An important feature of a dangerous driving style is high speed. Higher driving speed increases the risk of accidents (Aarts & van Schagen, 2006). Exceeding the speed limit is related to personality. Vulnerability to speeding is positively correlated with anger, excitement seeking, and normlessness, and negatively correlated with altruism (Machin & Sankey, 2008). Tao, Zhang, and Qu (2017) found speeding to be associated with higher neuroticism, higher psychoticism, and lower extraversion. Sensation seekers have a higher tendency to speed (Delhomme, Chaurand & Paran, 2012). Greaves and Ellison (2011) also found that excitement seeking and aggression are related to more instances of speeding. Personality is a predictor of slowing down when necessary in a driving simulation: higher conscientiousness and lower sensation seeking were related to the slowing (Schwebel, Severson, Ball, & Rizzo, 2006).

The lateral position of the vehicle on the road is also important for traffic safety: Cars driving closer to the center of the road might easily collide with oncoming vehicles. Several factors have been found to influence the lateral position in the lane. For instance, when trees are present around the road, drivers move closer to the center of the road. The closer the trees are to the road, the more the drivers stay toward the center (Calvi, 2015). Drivers tend to stay more in the middle of the lane when the lane width increases (Liu, Wang, & Fu, 2016). Drivers also drive closer to the center of the road when visibility is poor (Mollu et al., 2018). The relationship between personality and lateral position has not yet been researched. Currently, there is also a lack of research about the connection between personality and driving speed for professional drivers.

Therefore, we conducted a driving-simulator study to assess the connection between truck driver personality and their speed and lateral position. We included the most commonly studied traits—the Big Five personality traits, sensation seeking, and present time perspective—as the personality variables in our study.

2. Methods

2.1. Sample

The participants were 41 professional drivers who had a truck driver's license. They were recruited through researchers' personal contacts and through advertisements in transport companies and on the internet. Participants received 1000 CZK (approximately 46 USD) for their time. Participants had a mean age of 40.4 years (SD = 10.1). All were male. One participant was not included in the analysis because he completed only part of the study due to simulator sickness.

2.2. Measures

NEO – Five Factor Inventory (NEO-FFI; Hřebíčková & Urbánek, 2001) is the Czech version of the inventory to measure the Big Five personality traits—neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. It has 60 items, 12 for each of the five scales. Cronbach's alphas were 0.65 for neuroticism, 0.80 for extraversion, 0.55 for openness to experience, 0.71 for agreeableness, and 0.85 for conscientiousness.

Brief Sensation Seeking Scale (BSSS; Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002) is an eight-item scale that measures sensation seeking. The scale was translated and back-translated from/to Czech. The BSSS had Cronbach's alpha 0.72.

Short Version of the Zimbardo Time Perspective Inventory (ZTPI-short; Košťál, Klicperová-Baker, Lukavská, & Lukavský, 2016). We used the Czech version of the hedonistic and fatalistic present time perspective scales from the ZTPI-short. Both scales have three items. The hedonistic present time perspective scale had a Cronbach's alpha of 0.73, and for the fatalistic present time perspective scale it was 0.58.

Speed and lateral position in the lane. The measures of driving behavior that were assessed were speed and lateral position. The values were measured every 0.5 s using an Autosim AS 1600 driving simulator. Measurement began 100 m past the beginning of the scenario and ended 100 m before the end of the scenario. Lateral position in the lane was measured as the distance to the right of the center of the lane. The average values for speed and lateral position in each of the three scenarios were used in the analysis.

2.3. Procedure

The participants drove in four scenarios in the Autosim AS 1600 driving simulator at CDV – Transport Research Centre. Autosim AS 1600 is a truck-driving simulator with a truck cabin on a movable platform with three large screens in front and on both sides. At the beginning, the participants took a 15-min highway drive, which was used to familiarize the drivers with the driving simulator; it was not included in the analyses. After this warm-up drive, participants drove through three scenarios. The first scenario (80/80) was in a highway environment in a city (speed limit 80 kph), and there was an 80 kph speed limit sign two thirds of the way through the scenario; the whole scenario was straight. The second scenario (80/60) was also in a highway environment in a city (different from the first one), and there was a 60 kph speed limit sign two thirds of the way through the scenario; the whole scenario was straight. The third scenario (80/70) was in the countryside (normal speed limit 80 kph for trucks); the first half of the scenario was on a long left curve with a small slope on the right of the road and the second half was straight; there was a 70 kph speed limit sign three quarters of the way into the scenario. All of the scenarios had a low density of other cars. The participants drove through the three scenarios in random order.

2.4. Expected relationships

In the present research, there were eight personality variables—neuroticism, extraversion, openness to experience, agreeableness, conscientiousness, sensation seeking, hedonistic time perspective, and fatalistic present time perspective. We measured mean vehicle speed and mean lateral position to the right of the center of lane. Mean speed and mean lateral position were measured separately for each of the three scenarios, making a total of six variables. We assessed the relationship between personality variables and mean vehicle speed and mean lateral position.

We expected higher speed to be related to higher neuroticism and lower extraversion, as it was found to be related to speeding by Tao et al. (2017). We hypothesized that conscientiousness would be negatively related to speed, because it was previously found to be related to slowing (Schwebel et al., 2006) and negatively related to various unsafe driving practices (Qu et al., 2015; Šucha & Černochová, 2016; Taubman-Ben Ari & Yehiel, 2012). We also predicted that agreeableness would be negatively related to speed, because low agreeableness has previously been found to be connected with risky driving behavior (Dahlen et al., 2012; Qu et al., 2015; Šucha & Černochová, 2016; Taubman-Ben Ari & Yehiel, 2012). We did not expect openness to experience to be related to higher speed. We expected sensation seeking to be correlated with higher speed, as was found in previous studies (Delhomme et al., 2012; Schwebel et al., 2006). We expected higher speed to correlate with both hedonistic and fatalistic present time perspective, as present time perspective was found to be correlated with risky driving (Zimbardo et al, 1997).

Regarding lateral position, we were not certain what to expect because of the lack of previous research. Driving more to the left side of the lane happens when people want to improve their safety—when the road is closer to the trees or when visibility is bad (Calvi, 2015; Mollu et al., 2018). Because low agreeableness, low conscientiousness (Šucha & Černochová, 2016), and high sensation seeking (Ulleberg & Rundmo, 2003) are associated with risky driving behavior, we expect the same personality characteristics to be related to driving on the right.

3. Results

We used Pearson's r to assess the relationship between variables. We assessed the normality of the data with the Shapiro-Wilk test. For five variables—neuroticism, sensation seeking, fatalistic present time perspective, mean speed in the 80/60 scenario, and mean speed in the 80/80 scenario—we found the p-value to be less than 0.05 and rejected the null hypothesis about their normal distribution. Because Pearson's correlation coefficient assumes the normality of variables, we used Spearman's correlation coefficient ρ to assess the relationship between pairs of variables where one of the variables would not meet the assumption of normality. We used RStudio version 1.0.153 to compute the correlations.

The means and standard deviations of the average speeds and the lateral positions in the three scenarios are listed in Table 1. As expected, mean speed correlated negatively with conscientiousness in the 80/70 scenario ($r = -0.41$, $p < 0.05$); the correlation in the 80/60 scenario ($\rho = -0.29$, $p = 0.068$) was also close to significance. Correlations between speed and neuroticism, agreeableness, and extraversion were not significant, although they were in the expected direction. As expected, sensation seeking correlated with mean speed in the 80/70 scenario ($\rho = 0.34$, $p < 0.05$); the correlation in the

Table 1
Speed and lateral positions in the three scenarios.

Scenario	Mean speed of the driver (kph)		Mean lateral position of the driver from the right of the center of the lane (meters)	
	Mean	SD	Mean	SD
80/60	72.49368182	4.181856282	0.026881	0.120878
80/70	68.38356572	4.655601629	0.091946	0.117534
80/80	79.39367	2.972204	0.24788	0.094087

80/60 scenario ($\rho = 0.29$, $p = 0.066$) was also close to significance. Mean speed also correlated with hedonistic present time perspective in the 80/60 ($\rho = 0.35$, $p < 0.05$) and 80/80 ($\rho = 0.43$, $p < 0.01$) scenarios; the correlations between fatalistic present time perspective and speed were also positive, as expected, but not significant.

As we expected, sensation seeking correlated with driving more on the right side of the lane in the 80/70 ($\rho = 0.33$, $p < 0.05$) and the 80/80 ($\rho = 0.35$, $p < 0.05$) scenarios; the positive correlation in the 80/60 scenario ($\rho = 0.28$, $p = 0.077$) was also close to significance. Contrary to our expectations, we did not find significant negative correlations between agreeableness and either conscientiousness or driving more to the right of the center of the lane. Additionally, there was a significant correlation between driving more on the right side of the lane and extraversion in the 80/60 scenario ($r = 0.33$, $p < 0.05$); the correlation in the 80/80 scenario ($r = 0.31$, $p = 0.052$) was also close to significance. See Table 2 for more detailed results.

4. Discussion

Sensation seeking was found to be related to higher speed in the 80/70 scenario; correlations in the other scenarios were also in the expected direction, but not significant. Sensation seekers crave excitement, wild parties, and risky activities; therefore, the relation between sensation seeking and higher speed might be attributed to the simple fact that driving at a higher speed is more exciting. This finding is also in accordance with previous research: sensation seeking is related to risky driving (Dahlen et al., 2005; Iversen & Rundmo, 2002; Jonah, 1997; Ulleberg & Rundmo, 2003) and speeding (Delhomme et al., 2012; Greaves & Ellison, 2011). Higher speed is one of the features of a risky driving style; therefore, sensation seeking is related to higher speed as well.

Hedonistic present time perspective was also found to be related to higher speed. People with a higher hedonistic present time perspective seek arousal and they get this arousal by driving faster. Such a perspective might lead people to not care about the safety of their behaviors, such as driving at a higher speed. This connection also corresponds to previous research. Present time perspective is related to risky driving (Zimbardo et al., 1997); a higher speed for drivers with a higher hedonistic present time perspective seems to be in accordance with this finding. Nevertheless, the fact that speed was correlated only with hedonistic, but not fatalistic, present time perspective shows that the connection between risky driving activities and present time perspective might be related only to its hedonistic aspect.

Conscientiousness was related to lower speed in the 80/70 scenario. This negative relation was only marginally significant in the 80/60 scenario and not significant in the 80/80 scenario. The 80/80 scenario required straight driving with a constant speed limit throughout the whole scenario. The 80/60 scenario required straight driving, but the driver had to slow down when the speed limit changed. The 80/70 scenario first required the driver to slow down because of the curve and then again because of the speed limit change. More conscientious drivers, who were driving carefully to avoid risk, slowed down more than the less conscientious drivers in the scenario where slowing down increased driving safety (80/70), and not in the scenario where it was safe to maintain a constant speed throughout the whole scenario. The relation between conscientiousness and slower speed is consistent with previous findings. Conscientiousness is associated with a careful driving style (Taubman-Ben Ari & Yehiel, 2012) and less risky driving (Qu et al., 2015; Šucha & Černochová, 2016). Conscientious drivers also slow down when necessary (Schwebel et al., 2006).

Our findings about the relationships among speed and sensation seeking, present time perspective, and conscientiousness are all in accordance with previously published research. Nevertheless, the previous research was conducted with ordinary drivers and often with indirect methods, such as questionnaires. Our results show that these relationships are valid for professional truck drivers and for direct observation. We did not find relationships between high speed and neuroticism or low agreeableness as predicted. Although these personality characteristics are related to various aspects of risky driving practices, they were not found to be related to higher speed. We also did not find the predicted relationship between low

Table 2
Pearson/Spearman correlations between personality variables and both the mean speed and the mean lateral position in the three scenarios (n = 40).

	Mean speed			Mean lateral position to the right of the center of the lane		
	Scenario 80/60	Scenario 80/70	Scenario 80/80	Scenario 80/60	Scenario 80/70	Scenario 80/80
Neuroticism	*0.07*	*0.00*	*0.07*	*−0.06*	*−0.01*	*0.00*
Extraversion	*−0.12*	−0.12	*0.01*	0.33*	0.25	0.31+
Openness	*0.03*	0.07	*−0.11*	−0.08	0.07	0.02
Agreeableness	*−0.12*	0.03	*−0.19*	−0.05	−0.15	0.02
Conscientiousness	*−0.29*+	−0.41**	*−0.06*	0.02	0.08	−0.01
Sensation seeking	*0.29*+	*0.34**	*0.25*	*0.28*+	*0.33**	*0.35**
Hedonistic present	*0.35**	0.22	*0.43***	0.03	0.08	0.20
Fatalistic present	*0.22*	*0.26*	*0.09*	*0.07*	*−0.02*	*0.08*

Spearman correlations are in *italics*.
** $p < 0.01$.
* $p < 0.05$.
+ $p < 0.1$.

extraversion and speed. Although speeding was found to be associated with low extraversion (Tao et al., 2017), this relationship does not seem to be valid for the speed itself.

In our 80/70 scenario, it was safer to drive on the left side of the lane, because there was a left curve and a small slope to the right of the road, and the traffic flow density of oncoming cars was low. The other two scenarios were on the highway, and there was no oncoming traffic. In such conditions, drivers drive closer to the center of the road when they want to drive more safely (Calvi, 2015; Mollu et al., 2018).

Sensation seeking and extraversion were found to be related to driving more to the right side of the lane. The average lateral position of the drivers in all of the scenarios was more to the right, so these correlations meant that the participants who scored lower in extraversion or sensation seeking drove closer to the center of the lane, while people who scored more in extraversion and sensation seeking drove farther to the right. Because of the low density of cars, the safest position was in the center of the lane—less extraverted people and people who scored lower in sensation seeking, therefore, chose this safer route. These results are in accordance with previous research, because both sensation seeking (Ge et al., 2014; Oltedal & Rundmo, 2006; Ulleberg & Rundmo, 2003) and extraversion (Taubman-Ben Ari & Yehiel, 2012) are associated with risky driving practices.

5. Conclusion

The present study confirmed the relationship between personality variables and safe driving behavior. The primary contributions of the study include the following: first, the relationship between sensation seeking and higher speed previously found for regular drivers is also valid for professional truck drivers; second, not only speed, but also the lateral position of the car is related to personality; and third, conscientiousness is related to slowing down on curved roads.

Higher speed leads to a larger number of traffic accidents (Aljanahi, Rhodes, & Metcalfe, 1999) and more damage caused by these accidents (Elvik, 2013). Slowing down, therefore, increases traffic safety. The relationship between speed and conscientiousness, sensation seeking, and present time perspective helps to elucidate the personality profile of more dangerous drivers. Knowing this profile might help legal authorities adapt traffic safety policies.

We researched professional truck drivers in our study. Professional truck drivers in the Czech Republic and other countries are obliged to undergo a psychological examination to maintain their truck driving license. Because we found several personality variables to be related to the higher speed of professional drivers, the personality tests measuring these variables might be used to examine truck drivers seeking a renewal of their license. When a driver scores high in personality traits related to higher speed, it might be a signal to the psychologist that this driver might be a riskier driver. When a traffic psychologist conducts an examination regarding driving license prolongation, they can focus on issues like speeding during the interview with the driver. When the driver possesses personality traits related to driving more to the right side of the lane, the training could be adapted to this condition. Driving more on the right means that other drivers might see a larger space for overtaking and then overtake this driver more often. The training might, therefore, focus on the situation of being often overtaken. Driving more to the right might also mean that the driver gives less space to bicyclists they are overtaking, which is less safe for the bicyclists (Llorca, Angel-Domenech, Agustin-Gomez, & Garcia, 2017). The examiner should focus on this issue during the interview.

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