IJTE, Vol. 13, No. 2, Autumn 2025, pp. 2149-2171
Research Paper

Which Personality Types are More Prone to a Traffic Accident?

Hassan Jafari[1], Mansour Hadji Hosseinlou[2], Mahdi Yazdanpanah[3,*]

Received: 2024/11/20 *Accepted: 2025/09/02*

Abstract

Every 24 seconds, one person dies in a traffic accident. The most considerable rate of road traffic deaths occurs in low and middle-income countries. As a result, it is critical to pay special attention to road safety in these countries. Road safety may be influenced by human, road, and vehicle variables. Despite significant investments in automotive and road building, long-term benefits are not yet comparable with these expenses; as a result, it is required to investigate the sources of this inefficiency in other instances. Academics have traditionally paid less attention to human psychological factors, the primary element determining accidents. Due to the complexity of the human being, continual and broad research to establish its characteristics might always be beneficial in the long run for improving road safety. Numerous elements influence driver behaviour, including the driver's personality, identity, responsibility, haste, risk-taking, information, fear, loyalty, and experience. As a result, this study analyzed five personality traits of certified individuals residing in Tehran, Iran, using the standard 60-item NEO Five-Factor Inventory questionnaire (NEO-FFI). The impacts of these factors on the number of accidents over the last five years were also evaluated. The study employed a structural equation model and found that Neuroticism has a direct and significant association with the number of accidents during the previous five years. Contrary to this, agreeableness and openness had a significant and inverse relationship with the number of traffic accidents.

Keywords: Structural Equation Model, Personality Traits, Number of Accidents, Traffic Safety

[*] Corresponding author. Email address: m.yazdanpanah@fmgarmsar.ac.ir
[1] Department of Civil Engineering, K. N. Toosi University of Technology, Tehran, Iran
[2] Department of Civil Engineering, K. N. Toosi University of Technology, Tehran, Iran
[3] Department of Engineering, Faculty of Civil Engineering, University of Garmsar, Garmsar, Iran

1. Introduction

Ninety-three per cent of the deaths resulting from road traffic occur in low- to middle-income countries [WHO, 2021]. Compared to other higher middle-income countries, Iran has the third-highest number of road traffic fatalities [WHO, 2018a]. Similarly, road safety can be considered a global issue of concern to health and development. Globally, the World Health Organization (WHO) anticipates that road traffic injuries will account for the majority of fatalities by 2030 [WHO, 2009]. The effects of road accidents are substantial, both directly and indirectly. A road accident that kills or seriously injures a victim directly, or the associated socio-economic effects on their families indirectly, destroys a nation's and an individual's assets.

The factors that affect traffic safety include the driver, the vehicle, the road, and its surroundings. Due to the fact that humans play a critical role in road accidents, it will be essential to understand the effect of the psychological characteristics of drivers on roadway safety functions in order to provide solutions to prevent road accidents, which is the primary objective of this study.

According to the World Health Organization, the number of road deaths in the world in 2018 is estimated to be 1.35 million [WHO, 2018b]. Drivers and their personality traits are among the factors influencing the occurrence of dangerous situations while driving on the road. Research shows that human factors are involved in 80-90% of accidents [Hale & Glendon, 1987]. Consequently, many researchers have empirically examined the relationship between personality traits and accidents [Hansen, 1988; Keehn, 1961; Lawton & Parker, 1998]. However, their results are unreliable due to the fact that the personality traits studied in these studies were not classified, and various methods were used to measure them [Clarke & T Robertson, 2005]. In order to create a coherent and unique classification, models of five major personality factors were proposed [R. McCrae & Costa Jr, 1990], which researchers accepted as a valid and generalizable classification for the overall personality structure of individuals [Digman, 1990; Goldberg, 1993].

Concerning the factors related to psychological traits, in preliminary studies using the Maudsley Personality Inventory (MPI), it has been shown that high levels of extraversion and Neuroticism are associated with the occurrence of accidents [Pestonjee & Singh, 1980]. However, in later studies, there was no conclusive evidence that these factors were associated with road accidents. Lester [Lester, 1991], for example, reviewed nine different studies that examined the relationship between extraversion and Neuroticism and accidents and concluded that none of these characteristics has a specific correlation to accidents based on previous studies. Elender et al. [Elander, West, & French, 1993], on the other hand, claimed that it is not helpful to study extraversion and Neuroticism. However, they have been controlled and monitored in many studies to assess the effects of personalities on traffic accidents.

Several studies have examined the relationship between personality traits and accidents using the five-factor model. Arthur and Granziano [Arthur Jr & Graziano, 1996], for example, stated that conscientiousness and the probability of accidents are negatively correlated. In another study by cellar [Cellar, Nelson, & Yorke, 2000] it was found that agreeableness was negatively correlated to the number of fines and the number of accidents. In the next study, conducted in 2003 by Ulleberg [Ulleberg & Rundmo, 2003] an intermediate model in which driving behaviors were predicted based on personality traits was tested using factors including perceived risk and safe traffic behavior. The researchers used specific factors of the five-factor model, such as altruism, which is a subset of agreeableness, or anxiety, which is a subset of Neuroticism, or stimulus, which is a subset of extroversion, as predictors affecting the driving behavior.

Clarke et al. [Clarke & T Robertson, 2005] conducted a meta-analysis on the five-factor model of predicting the number of accidents based on personality traits with a particular focus on professional and non-professional drivers. They concluded that three out of five personality factors, which are extraversion, conscientiousness, and agreeableness, are significantly related to the number of accidents. Neuroticism and empiricism also seem to modulate the relationship between personality and participation in accidents. Although the relationship between personality traits and the number of accidents has been identified in some studies, more conceptual models should be used in this field. Elander et al. [Elander et al., 1993] stated that personality-related variables affect the risk of accidents and intensity of collisions through driving behavior. They have also suggested that personality variables, as stable and consistent causes of the accident, should be separated from unstable and transient factors.

Hasaninasab, et al. [Hasaninasab, Jalili, & Mirani, 2021] examined the effect of personality traits on the number of accidents and the frequency of fines for university students who had active driver's licenses. Their results showed that personality traits have a significant relationship with the number of fines and the number of accidents as well as the tendency to show aggressive behaviors. Also, they found that eating and drinking while driving is the most effective among other high-risk behaviors. In addition, many studies have examined the relationship between fatigue and the likelihood of an accident [Moradi, Nazari, & Rahmani, 2019]. The importance of professional drivers is not hidden from anyone because they are responsible not only for transported goods but also for other people [Mamcarz, Droździel, Madleňáková, Sieradzki, & Droździel, 2019]. Hence, there are many extensive studies that concern various factors, such as work environment and work-related stresses, on the health of professional drivers [Lemke & Apostolopoulos, 2015].

Researchers have also examined the stress history and the severity of the accidents. They showed that there is a unique connection between accident distress and anxious behavior in those who have more severe life stress [Clapp et al., 2011]. By examining driver stress levels using galvanic skin response sensor data, the researchers found that women generally experienced more stress than men while driving. Also, drivers with less than two years of driving experience were more likely to have driving stress, while drivers with 10 or 15 years of driving experience showed the least amount of driving stress. In addition, driving frequency during the week is one of the factors affecting the stress of drivers, knowing that people who drive every day are the least stressful drivers and people who drive once a week are the most stressful drivers [Dogan, Bogosyan, & Acarman, 2019].

Researchers in Mexico also looked at the factors that lead to stress in Mexican drivers. The results indicate that dealing with aggressive drivers who do not respect social rules is one of the most critical stressors in drivers, while gender and age group do not affect the amount of stress [Argandar, Gil, & Berlanga, 2016]. In another study, the relationship between anxiety and dangerous driving was evaluated. The results of this study showed that regardless of the gender of drivers, higher levels of anxiety were associated with higher levels of dangerous driving [Dula, Adams, Miesner, & Leonard, 2010]. Driving stress is also effective in creating driving discourtesy [Scott-Parker, Jones, Rune, & Tucker, 2018]. Researchers have shown that stress in the workplace, living environment and even stress while driving affect the quality of people driving, and drivers who are stressed are more prone to go wrong [Rowden, Matthews, Watson, & Biggs, 2011].

Recent study has underscored strong correlations between personality factors and the probability of road accidents, illustrating how individual psychological qualities influence driving habits. Table 1 consolidates findings

from rigorous research published between 2022 and 2025, concentrating on the Big Five personality traits, impulsivity, and sensation-seeking behaviors.

Recent research have examined the correlations between personality types and driving practices, with consequences for traffic safety. A meta-analysis conducted by [Luo, Yan & Weina, 2023] revealed that conscientiousness, agreeableness, and openness were inversely correlated with risky and aggressive driving, but neuroticism exhibited favorable correlations. Another study performed an extensive evaluation, pinpointing essential study domains and proposing future avenues, including the necessity for investigations into broader personality traits and subtypes [Pereira, Bamel, Paul, & Varma, 2022]. Haghdoost classified sociocultural elements influencing road traffic accidents into four categories: sociodemographic parameters, personality traits, driving conduct, and driver performance [Haghdoust et al., 2022]. Another study examined the correlation between the Big Five personality traits and hazardous driving, revealing substantial links with agreeableness and neuroticism [Chrisnatalia, Dian, & Stephanus, 2023]. These studies jointly underscore the significance of personality traits in comprehending and forecasting driving behaviors and traffic incidents, with possible implications for driver selection, policy formulation, and safety measures.

Also, Mediation analyses demonstrated that attitude and intention completely mediated the relationships between neuroticism, agreeableness, and conscientiousness and traffic violations, signifying that these personality qualities affect violations solely through these intermediary components [Găianu, Cezar, & Paul Sârbescu 2024]. Conversely, normative beliefs (subjective and descriptive norms) and purpose demonstrated only a small mediating influence, but agreeableness maintained a direct correlation with violations even after accounting for normative beliefs. The findings indicate that treatments aimed at behavioral beliefs (attitude) and intention may successfully reduce the impact of personality factors on traffic offenses, providing important insights for improving road safety measures [Găianu, Cezar, & Paul Sârbescu 2024].

This study uses a structural equation model to examine the impact of Big Five personality traits on road accidents in Iran. This strategy lets us go beyond correlational data and study how personality variables affect accident involvement. Combining analytical rigor with Iran's cultural and environmental setting is a major advance. Our findings can help develop targeted treatments by identifying Iranian personality features connected to accident risk. This may include advising driver training programs, establishing personality-based risk assessment tools, or participating in safer driving awareness campaigns. Understanding these psychological elements can improve engineering-based safety measures, making them more comprehensive and successful in reducing road accidents and fatalities. It is necessary to highlight that our study examines the link between personality qualities and accidents within our specified sample population.

In spite of the considerable efforts made to measure the effect of psychological variables, particularly personality traits, on traffic accidents, little is known regarding the direct impact of the big five personality traits on the number of traffic accidents. Consequently, this study analyzed the direct effects of the big five personality traits on the number of traffic accidents reported by Iranian drivers over the past five years using a structural equation model. The remainder of the paper is organized as follows: The methods for collecting and analyzing data are outlined in section 2. The results of this study and the discussion are presented in section 3. Finally, the conclusions and future directions are discussed in section 4.

2. Materials and Methods

2.1. Structural Equation Modeling

Structural Equation Modeling (SEM) proficiently assesses latent variables and their interrelations in the examination of personality traits and traffic accidents, although alternative modeling techniques provide supplementary insights. Hierarchical Linear Modeling (HLM) facilitates the analysis of nested data, such as drivers within regions, to discern individual and group-level predictors and accommodate variations in regional accident risk; yet, it necessitates extensive multilevel data and poses interpretative challenges. Random Forests and Neural Networks can predict by identifying subtle patterns in extensive datasets; however, their interpretability is compromised, and overfitting constrains their explanatory value. Generalized Linear Models (GLMs), such as Poisson and Negative Binomial regression, can effectively model accident count data with interpretable coefficients; however, they are unable to incorporate latent variables as Structural Equation Modeling (SEM) does. Bayesian modeling employs prior information and uncertainty to estimate parameters, providing flexibility and understandable believable intervals, yet necessitating meticulous definition and computer resources. These methodologies underscore the connection between the analytical methodology and the study objectives and data characteristics in transportation safety investigations.

In structural equation modeling (SEM), multiple dependent and independent variables are simultaneously modeled and estimated [Hair Jr et al., 2021]. In SEM, there is a structural model and a measurement model. According to the structural model, a set of linear equations describes the theoretical causal relationships between the latent variables through a set of linear equations. In the measurement model, unobservable latent variables are measured through observable indicators [Bollen, 1989; Lomax, 1982, 1983].

SEM analysis is based on the following equations (equation (1) to (3)) [Bollen, 1989; Lomax, 1982, 1983; Washington, Karlaftis, Mannering, & Anastasopoulos, 2020]:

Structural model:

$$\eta = \beta\eta + \gamma\xi + \zeta \quad (1)$$

There are three variables in this model: η represents the latent endogenous variables; ξ represents the latent exogenous variables; ζ is a vector of random variables. In addition, βrepresents the structural coefficient matrix for the latent endogenous variables, and γ denotes the latent exogenous variable's structural coefficient matrix.

A simple equation can be used to describe the exogenous variables in the measurement model:

$$X = \Lambda_x\xi + \delta \quad (2)$$

Similarly, the equation for the measurement model for endogenous variables can be written as follows:

$$Y = \Lambda_y\eta + \varepsilon \quad (3)$$

Where X and Y represent observed exogenous and endogenous variables, respectively; Λ_x and Λ_y represent structural coefficients, and δ and ε represent error terms according to the exogenous and endogenous variables, respectively.

As a result, model parameter values were estimated in a manner that minimized the discrepancy function between the model-implied covariance matrix and the observed covariance matrix, most often using the maximum likelihood method [Lee, Chae, Yoon, & Yang, 2018].

2.2. NEO personality Inventory Test

The personality traits that have been selected as the psychological variables of the forthcoming research have always been used in various research fields in a way that "dimensions of the differences of individuals related to their desire to express consistent patterns of thoughts and ideas, emotions and actions" are defined [R. R. McCrae & Costa, 2003]. We assessed the traits defined by the Five Factor Theory of

personality using the NEO-FFI test, which used 60 items (questions) [Costa & McCrae, 1989].

As a result of research dating back to the 1970s, based on factor analysis on the observations and behaviors reported by individuals, researchers have found that personality traits typically include five main components known as “big five personality traits” [Almlund, Duckworth, Heckman, & Kautz, 2011; Goldberg, 1993]. These big five personality traits include openness (The tendency to be open to the subtle and aesthetic nature, cultural or intellectual experiences), conscientiousness (the tendency to be orderly, responsible and hardworking), extroversion (the tendency of interest and energy of individuals to the outside world including people and objects compared to the inside world. A mental experience associated with positive and sociable sentiments), agreeableness (tendency to engage in unselfish and cooperative behavior) and Neuroticism (extreme levels of sentimental instability and proneness to psychological disorders) [Costa Jr & McCrae, 2008; R. R. McCrae, 2002; Rouw & Scholte, 2016].

The NEO-FFI uses self-rated statements to assess an individual's Big Five personality traits (Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness). The 12 statements for each feature range from "strongly disagree" to "strongly agree." These items capture personality factors that may affect an individual's reactions in various situations, including driving, without directly asking about driving behavior. For instance, a high Neuroticism score may increase anxiety and impulsivity in unexpected traffic situations.

Subsequent to inquiring about NEO-FFI questions, we directly questioned respondents regarding the number of traffic accidents they experienced in the past five years, categorizing their responses as none, one, two, three, or more than three accidents. The outcomes displayed in Table 1.

2.3. Data

A total of 388 valid questionnaires were collected from Tehran residents with driving experience for the present study. The statistical description of the questionnaires is shown in Table (1). After analyzing the internal consistency of the NEO Personality Questionnaire based on Cronbach’s alpha criterion, it was found that all scales have appropriate consistency values, except for the variable related to openness, which has a Cronbach’s alpha of 0.559. The internal consistency of each personality trait based on Cronbach’s alpha is: Openness ($\alpha = 0.559$), conscientiousness ($= 0.799$), extroversion ($= 0.681$), agreeableness ($= 0.665$), Neuroticism ($= 0.715$).

Table 1. The statistical description of the responders

	Number	Percentage (%)		Number	Percentage (%)
Gender			**Monthly household income (IRR)**		
Male	326	84.0	< 30 M	149	38.4
Female	48	12.4	30-100 M	196	50.5
Not mentioned	14	3.6	100-200 M	22	5.7
Age			> 200 M	4	1
< 30	158	40.7	Not mentioned	17	4.4
30-40	104	26.8	**Driving experience**		
> 40	110	28.4	None	17	4.4
Not mentioned	16	4.1	1-5 years	84	21.6
Marital status			5-10 years	93	24.0
Single	178	45.9	10-15 years	56	14.4
Married	196	50.5	15-20 years	44	11.3

	Number	Percentage (%)		Number	Percentage (%)
Not mentioned	14	3.6	> 20 years	76	19.6
Education			Not mentioned	18	4.6
Literacy	4	1.0	**Vehicle ownership**		
High school	51	13.2	Owner	242	62.4
Diploma	88	22.7	Not owner	134	34.5
B.Sc.	114	29.4	Not mentioned	12	3.1
M.Sc.	70	18.0	**annual driving fines (IRR)**		
PhD.	7	1.8	None	57	14.7
Not mentioned	54	13.9	< 1 M	139	35.8
The average number of driving fines			1-10 M	99	25.5
0	69	17.8	10-20 M	37	9.5
1	46	11.9	20-50 M	17	4.4
2	59	15.2	> 50 M	3	0.8
3	36	9.3	Not mentioned	36	9.3
4	16	4.1	**Smoking status**		
5	43	11.1	Yes	104	26.8
			No	284	73.2
5-10	47	12.1	**Addiction status**		
> 10	30	7.7	Yes	21	5.4
Not mentioned	42	10.8	No	367	94.6
Have you had any accident in the last 5 years?			**Family head**		
Yes	237	61.1	Yes	216	55.7
No	146	37.6	No	163	42
Not mentioned	5	1.3	Not mentioned	9	2.3
Number of traffic accidents in the last 5 years			**Time of day accident happened**		
None	137	35.3	Morning	51	13.1
1	79	20.4	Midday	48	12.4
2	56	14.4	Noon	39	10.1
3	21	5.4	Afternoon	53	13.7
More than 3	39	10.1	Night	35	9.0
Not mentioned	56	14.4	Midnight	8	2.1
Have you been responsible for the accident?			Not mentioned	154	39.7
Yes	109	28.1	**Type of accident**		
No	116	29.9	Vehicle to vehicle	171	44.1
Not mentioned	163	42.0	Vehicle to pedestrian	12	3.1
Weather at the time of the accident			Vehicle to obstacle	19	4.9
Snowy	15	3.9	Vehicle to motorcycle	18	4.6
Rainy	37	9.5	Overturn	10	2.6
Cloudy	20	5.2	Other	5	1.3
Clear	162	41.8	Not mentioned	153	39.4
Not mentioned	154	39.7	**Damage taken**		
Road type			Light damage	145	37.4
Freeway	31	8.0	Sever damage	60	15.5
Multiple-lane highway	59	15.2	Light injury	14	3.6
2-way road	78	20.1	Severe injury	9	2.3

	Number	Percentage (%)		Number	Percentage (%)
Arterial way	26	6.7	Death	4	1.0
Collector-local way	36	9.3	Not mentioned	156	40.3
Not mentioned	158	40.7	**Did you have emotional tension at the time of the accident?**		
			Yes	49	12.6
			No	174	44.8
			Not mentioned	165	42.6

3. Results and Discussions

Personality traits were measured using the NEO-FFI questionnaire, which has 60 indicators related to five major characteristics [R. R. McCrae & Costa Jr, 2004]. Each personality trait was evaluated using 12 indicators and measured using a 5-point Likert scale, in which 0 indicates "strongly opposite" and 4 indicates "strongly agreed". The internal consistency of the five major traits was confirmed using Cronbach's alpha and the obtained values were $\alpha = 0.715$ for neuroticism, $\alpha = 0.681$ for extroversion, $\alpha = 0.55$ for openness, $\alpha = 0.665$ for agreeableness and $\alpha = 0.799$ for conscientiousness. All traits with Cronbach's alpha greater than 0.6 were satisfactory and reliable considering the internal consistency, except for the openness personality trait whose α was less than 0.6. Therefore, using the structural equation model, we evaluated the relationship between these five personality traits and the number of accidents. We have examined the effect of each of the personality traits on the number of accidents experienced by drivers in the last five years.

3.1. SEM Results for the Effect of the Neuroticism Latent Variable on the Number of Accidents

Figure (1) shows the result of the structural equation model related to the effect of the neuroticism latent variable on the number of accidents. As shown in Table (2), the estimated parameters of the model in Figure (1) can be found.

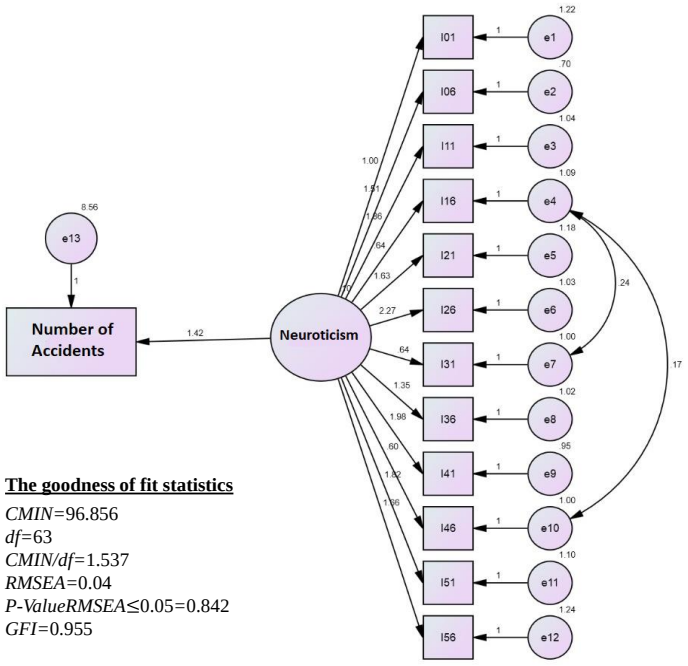

Figure 1. The result of the structural equation model related to the effect of the neuroticism latent variable on the number of accidents

Table 2. The result of the structural equation model related to the effect of the neuroticism latent variable on the number of accidents

Parameters	Estimation	Standard error	t value	P-value
Variance				
Neuroticism	0.104	0.046	2.231	0.026
e_1	1.216	0.097	12.471	0.000
e_2	0.703	0.062	11.304	0.000
e_3	1.035	0.092	11.257	0.000
e_4	1.089	0.086	12.704	0.000
e_5	1.181	0.100	11.785	0.000
e_6	1.028	0.099	10.843	0.000
e_7	1.001	0.079	12.670	0.000
e_8	1.018	0.085	12.009	0.000
e_9	0.951	0.088	10.866	0.000
e_{10}	0.997	0.079	12.694	0.000
e_{11}	1.105	0.097	11.424	0.000
e_{12}	1.241	0.105	11.803	0.000
e_{13}	8.564	0.672	12.751	0.000
Covariance				
$e_{10} \leftrightarrow e_4$	0.174	0.057	3.040	0.002
$e_7 \leftrightarrow e_4$	0.245	0.059	4.144	0.000
Factor load				
Neuroticism I01 →	1.000			
Neuroticism I06 →	1.509	0.376	4.011	0.000
Neuroticism I11 →	1.858	0.462	4.022	0.000
Neuroticism I16 →	0.643	0.253	2.543	0.011
Neuroticism I21 →	1.629	0.423	3.850	0.000
Neuroticism I26 →	2.272	0.547	4.153	0.000
Neuroticism I31 →	0.636	0.245	2.603	0.009
Neuroticism I36 →	1.347	0.361	3.726	0.000
Neuroticism I41 →	1.985	0.484	4.097	0.000
Neuroticism I46 →	0.596	0.239	2.492	0.013
Neuroticism I51 →	1.818	0.457	3.980	0.000
Neuroticism I56 →	1.656	0.431	3.842	0.000
Neuroticism → *number of accidents*	1.424	0.663	2.148	0.032

From Figure (1) and Table (2), it can be seen that the model has a good fit, and all coefficients are significant. Neurotic personality traits are associated with an increased risk of being involved in an accident, as evidenced by the path coefficient of 1.424, which indicates that neurotic people are more likely to be involved in a motor vehicle accident. The results of this study are in agreement with those of previous studies [Niranjan, Gabaldon, Hawkins, Gupta, & McBride, 2022; Sümer, Lajunen, & Özkan, 2005]. Using artificial neural networks, another study found that driver's Neuroticism is an important factor in increasing the performance of the prediction of excessive rotation speed among truck drivers [Wei, Lee, Luo, & Lu, 2021]. Furthermore, according to both the models presented in this section and those in the following sections, Neuroticism has the highest positive path coefficient on the number of accidents. Due to this, it is necessary to pay special attention to people with this personality trait in order to prevent traffic accidents.

3.2. SEM Results for the Effect of the Conscientiousness Latent Variable on the Number of Accidents

Figure (2) shows the result of the structural equation model related to the effect of the conscientiousness latent variable on the number of accidents. As shown in Table (3), the estimated parameters of the model in Figure (2) can be found.

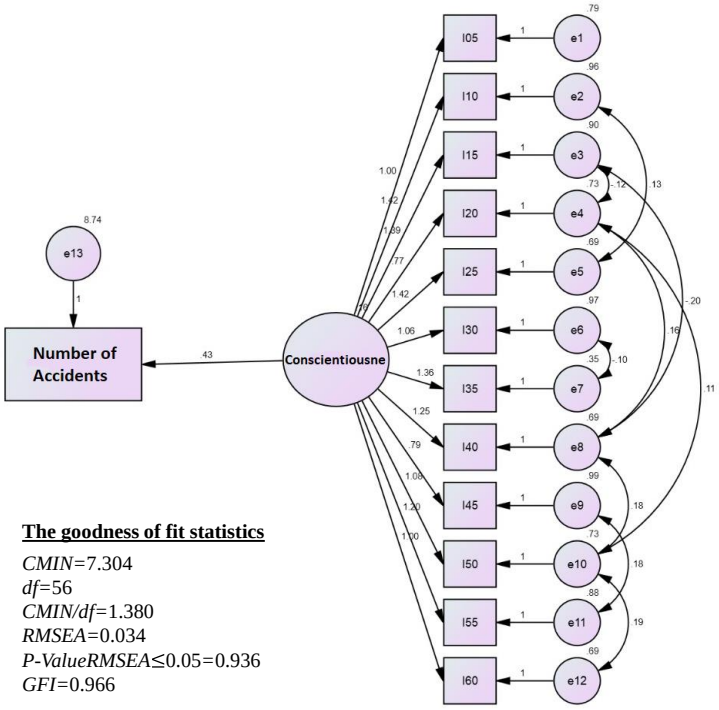

Figure 2. The result of the structural equation model related to the effect of the conscientiousness latent variable on the number of accidents

Table 3. The result of the structural equation model related to the effect of the conscientiousness latent variable on the number of accidents

Parameter	Estimation	Standard error	t-test	P-value
Variance				
conscientiousness	0.156	0.046	3.423	0.000
e_1	0.786	0.065	12.151	0.000
e_2	0.961	0.083	11.544	0.000
e_3	0.902	0.079	11.423	0.000
e_4	0.729	0.059	12.252	0.000
e_5	0.690	0.062	11.081	0.000
e_6	0.974	0.081	1.971	0.000
e_7	0.351	0.037	9.495	0.000
e_8	0.691	0.061	11.271	0.000
e_9	0.988	0.079	12.489	0.000
e_{10}	0.735	0.061	11.947	0.000
e_{11}	0.882	0.074	11.933	0.000
e_{12}	0.692	0.057	12.040	0.000
e_{13}	8.745	0.680	12.853	0.000
Covariance				
$e_8 \leftrightarrow e_3$	-0.198	0.047	-4.186	0.000
$e_{12} \leftrightarrow e_{10}$	0.191	0.041	4.616	0.000

Parameter	Estimation	Standard error	t-test	P-value
$e_{10} \leftrightarrow e_8$	0.178	0.044	4.082	0.000
$e_{11} \leftrightarrow e_9$	0.179	0.055	3.222	0.001
$e_5 \leftrightarrow e_2$	0.133	0.053	2.524	0.012
$e_4 \leftrightarrow e_3$	-0.118	0.048	-2.463	0.014
$e_8 \leftrightarrow e_4$	0.158	0.044	3.570	0.000
$e_{10} \leftrightarrow e_1$	0.111	0.042	2.655	0.008
$e_7 \leftrightarrow e_6$	-0.100	0.039	-2.571	0.010
Factor load				
conscientiousness I05 →	1.000			
conscientiousness I10 →	1.421	0.257	5.530	0.000
conscientiousness I15 →	1.391	0.252	5.521	0.000
conscientiousness I20 →	0.772	0.178	4.329	0.000
conscientiousness I25 →	1.422	0.243	5.852	0.000
conscientiousness I30 →	1.059	0.223	4.751	0.000
conscientiousness I35 →	1.360	0.219	6.222	0.000
conscientiousness I40 →	1.254	0.225	5.561	0.000
conscientiousness I45 →	0.791	0.194	4.085	0.000
conscientiousness I50 →	1.077	0.207	5.201	0.000
conscientiousness I55 →	1.199	0.226	5.297	0.000
conscientiousness I60 →	1.004	0.194	5.169	0.000
conscientiousness → *number of accidents*	0.434	0.469	0.927	0.354

A good fit can be observed in Figure (2) and Table (3), and all factor load coefficients are significant, with the exception of the path coefficient of conscientiousness on the number of accidents. In contrast, previous studies have shown that the conscientiousness personality has greater predictive power than other personality traits in predicting accidents. However, the effect of conscientiousness on accident risk has been measured indirectly and via a mediating variable (e.g., aberrant driving behavior) [Sümer et al., 2005; Wei et al., 2021]. According to another study, conscientiousness has a negative effect on taking conscious risks on the road [Baran, Zieliński, & Dziuda, 2021]. Conscientiousness may not have had a significant direct impact on driver accidents over the past five years, but its indirect effects are likely to be undeniable.

3.3. SEM Results for the Effect of the Agreeableness Latent Variable on the Number of Accidents

Figure (3) shows the result of the structural equation model related to the effect of the agreeableness variable on the number of accidents. As shown in Table (4), the estimated parameters of the model in Figure (3) can be found.

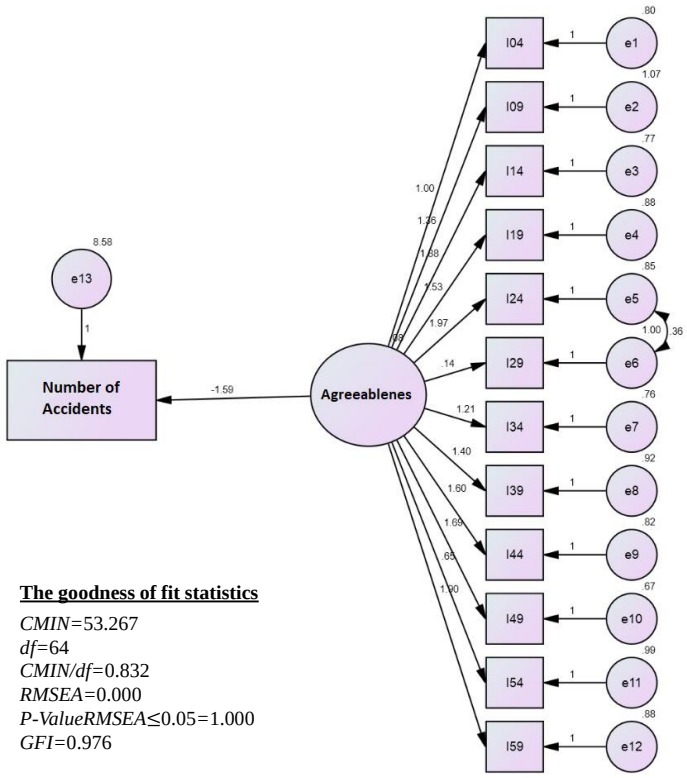

Figure 3. the result of the structural equation model related to the effect of the agreeableness latent variable on the number of accidents

Table 4. the result of the structural equation model related to the effect of the agreeableness latent variable on the number of accidents

Parameter	Estimation	Standard error	t-test	P-value
Variance				
agreeableness	0.075	0.033	2.287	0.022
e_1	0.798	0.065	12.354	0.000
e_2	1.072	0.088	12.164	0.000
e_3	0.770	0.070	10.972	0.000
e_4	0.876	0.074	11.771	0.000
e_5	0.848	0.077	10.952	0.000
e_6	1.003	0.078	12.855	0.000
e_7	0.755	0.063	12.073	0.000
e_8	0.918	0.077	11.997	0.000
e_9	0.825	0.071	11.590	0.000
e_{10}	0.668	0.060	11.121	0.000
e_{11}	0.992	0.078	12.693	0.000
e_{12}	0.884	0.079	11.182	0.000
e_{13}	8.584	0.674	12.745	0.000
Covariance				
$e_5 \leftrightarrow e_6$	0.358	0.059	6.111	0.000
Factor load				
agreeableness I04 →	1.000			
agreeableness I09 →	1.357	0.386	3.516	0.000
agreeableness I14 →	1.885	0.463	4.070	0.000

Parameter	Estimation	Standard error	t-test	P-value
agreeableness I19→	1.530	0.402	3.804	0.000
agreeableness I24→	1.970	0.485	4.062	0.000
agreeableness I29→	0.141	0.248	0.569	0.569
agreeableness I34→	1.210	0.336	3.601	0.000
agreeableness I39→	1.396	0.381	3.662	0.000
agreeableness I44→	1.603	0.412	3.888	0.000
agreeableness I49→	1.686	0.418	4.036	0.000
agreeableness I54→	0.646	0.276	2.339	0.019
agreeableness I59→	1.905	0.474	4.021	0.000
agreeableness I04→number of accidents	-1.588	0.780	-2.035	0.042

A significant negative relationship was shown to exist between agreeableness and the number of accidents related to drivers in the last five years, as shown in Figure (3) and Table (4). Our findings are consistent with those of previous studies, which confirm that road accidents are associated with low levels of agreeableness [Sümer et al., 2005; Wei et al., 2021]. People who have low levels of agreeableness have been found to act aggressively behind the wheel, engage in road rage, have difficulties communicating with other road users, and violate safety rules on the road more frequently than their counterparts with high levels of agreeableness [Sümer et al., 2005]. As a consequence, it seems imperative that accurate measurements of people with low levels of agreeableness be taken in order to enhance traffic accident safety.

3.4. SEM Results for the Effect of the Extraversion Latent Variable on the Number of Accidents

Figure (4) shows the result of the structural equation model related to the effect of the agreeableness variable on the number of accidents. As shown in Table (5), the estimated parameters of the model in Figure (4) can be found.

The path coefficient of extraversion is estimated negatively, but it is not statistically significant. Therefore, extroversion does not appear to have a direct impact on the number of accidents. We should note that the sign of the path coefficient agrees with previous studies in the field of transportation safety [Sümer et al., 2005]. The indirect effect of this variable should therefore be taken into account in future studies.

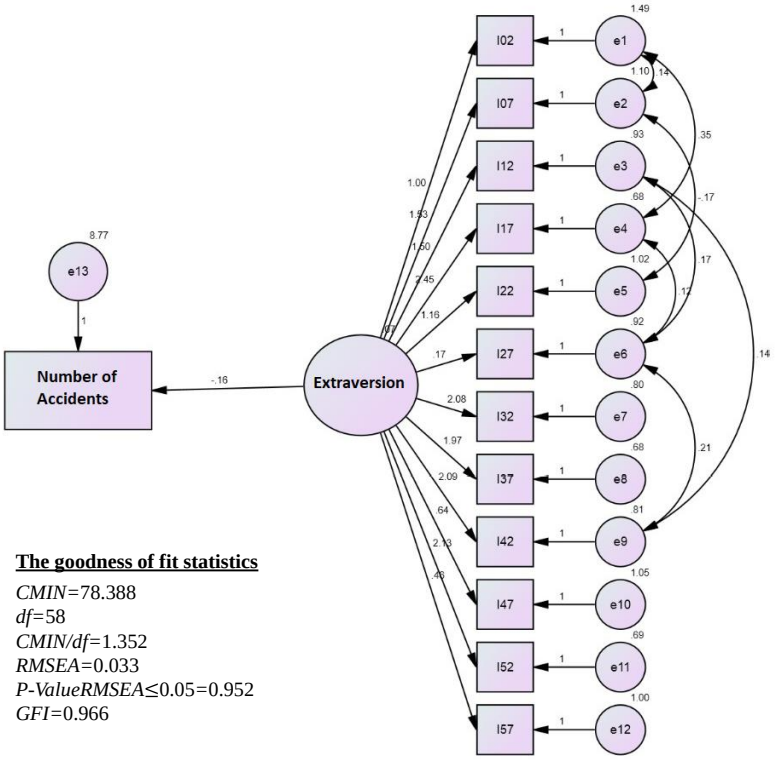

Figure 4. the result of the structural equation model related to the effect of the Extraversion latent variable on the number of accidents

Table 5. the result of the structural equation model related to the effect of the Extraversion latent variable on the number of accidents

Parameter	Estimation	Standard error	t-test	P-value
Variance				
Extraversion	0.066	0.043	1.528	0.127
e_1	1.493	0.119	12.593	0.000
e_2	1.101	0.091	12.124	0.000
e_3	0.926	0.078	11.933	0.000
e_4	0.683	0.070	9.826	0.000
e_5	1.021	0.082	12.399	0.000
e_6	0.916	0.071	12.868	0.000
e_7	0.805	0.073	11.076	0.000
e_8	0.682	0.062	10.968	0.000
e_9	0.809	0.074	10.935	0.000
e_{10}	1.051	0.083	12.737	0.000
e_{11}	0.691	0.065	10.673	0.000
e_{12}	0.996	0.078	12.794	0.000
e_{13}	8.772	0.682	12.864	0.000
Covariance				
$e_4 \leftrightarrow e_1$	0.352	0.068	5.186	0.000
$e_9 \leftrightarrow e_6$	0.212	0.053	3.998	0.000
$e_5 \leftrightarrow e_2$	-0.165	0.061	-2.701	0.000
$e_6 \leftrightarrow e_3$	0.174	0.053	3.258	0.000
$e_6 \leftrightarrow e_4$	0.121	0.046	2.610	0.000

Parameter	Estimation	Standard error	t-test	P-value
$e_9 \leftrightarrow e_3$	0.135	0.055	2.455	0.000
$e_2 \leftrightarrow e_1$	0.144	0.069	2.093	0.000
Factor load				
Extraversion I02 →	1.000			
Extraversion I07 →	1.531	0.543	2.819	0.005
Extraversion I12 →	1.498	0.550	2.723	0.006
Extraversion I17 →	2.453	0.751	3.268	0.001
Extraversion I22 →	1.159	0.458	2.530	0.011
Extraversion I27 →	0.169	0.267	0.634	0.526
Extraversion I32 →	2.081	0.718	2.899	0.004
Extraversion I37 →	1.972	0.679	2.907	0.004
Extraversion I42 →	2.093	0.723	2.893	0.004
Extraversion I47 →	0.640	0.332	1.930	0.054
Extraversion I52 →	2.130	0.728	2.924	0.003
Extraversion I57 →	0.464	0.293	1.585	0.113
Extraversion → number of accidents	-0.164	0.745	-0.220	0.826

3.5. SEM Results for the Effect of the Openness Latent Variable on the Number of Accidents

Figure (5) shows the result of the structural equation model related to the effect of the openness variable on the number of accidents. As shown in Table (6), the estimated parameters of the model in Figure (5) can be found.

The results indicate that people with a high level of openness are less likely to be involved in traffic accidents, and the relationship is significant, with a 90% confidence level. Openness is a trait related to accident involvement that is less studied [Sümer et al., 2005]. In previous studies, different results have been reported regarding the degree of openness and involvement in traffic accidents [Baran et al., 2021; Sümer et al., 2005; Wei et al., 2021]. According to a previous study, openness was the only personality trait among the five big personality dimensions that affected the risk of traffic accidents directly and indirectly. Openness has been shown to affect aberrant driving behaviors negatively and positively affect accident risk. These contradictory results may be attributed to the multifaceted nature of personality traits when confronted with the complex conditions of traffic accidents. Due to the fact that in some previous studies, personality traits were included as an observed variable, the relationship and path coefficients may have been misestimated and associated with errors.

This study and similar study condected in iran [Hasaninasab et al., 2022] both emphasize the significant influence of human characteristics, especially personality traits, in forecasting traffic accidents. Nonetheless, they vary in their theoretical frameworks, methodology, and principal findings. Their research utilizes the Myers-Briggs Type Indicator (MBTI) to classify personality into dimensions such as perceptual-judging and extroversion-introversion, identifying "perceptual" traits, aggressive behavior, and distraction as key predictors of accidents through multivariate regression analysis. Our study employs the Five-Factor Model (Big Five) utilizing the NEO-FFI questionnaire and Structural Equation Modeling (SEM) to examine 388 drivers in Tehran. It identifies Neuroticism as a direct positive predictor of accidents, whereas Agreeableness and Openness serve as protective variables, with no significant direct impacts observed for Conscientiousness or Extraversion. This study employs SEM for a detailed examination of latent variables and intricate interactions, whereas they utilizes

regression for predictive analysis [Hasaninasab et al., 2022]. Both research highlight the significance of psychological evaluations in road safety, however they differ in the personality frameworks employed and the particular traits prioritized. Our research highlights emotional stability (low Neuroticism) and social cooperation (high Agreeableness), whereas they are concentrate on perceptual inclinations and behavioral elements such as hostility [Hasaninasab et al., 2022]. The disparities underscore the diverse methodologies for correlating personality with driving outcomes, indicating that interventions could be enhanced by amalgamating several models to encompass both trait-oriented and behavioral aspects of risk.

This research shows that personality traits—specifically Neuroticism, Agreeableness, and Openness—significantly affect road accident risk, suggesting policy solutions. Based on personality assessments like the NEO-FFI, driver training programs can tailor interventions like stress management for neurotic drivers and cooperative driving for low Agreeableness drivers to improve safety. Graduated Driver Licensing (GDL) schemes may use these evaluations to prolong high-risk driver limitations, reducing accident rates. Public awareness campaigns targeting personality-specific threats and encouraging stress management or cooperation may improve safe driving attitudes. Psychological tests during licensure could help identify high-risk drivers who need additional training or interventions. Professional drivers' workplace regulations could use personality profiles to assign less stressful tasks to neurotic people or boost Agreeableness through teamwork, improving safety and occupational health.

Moreover, the finding is consistent with previous research on personality traits and driving behavior [Luo, Yan & Weina, 2023]. Neuroticism—emotional instability, anxiety, and impulsivity—may increase accident risk by affecting decision-making under stress and increasing risky behaviors like aggressive driving or poor danger perception. Conversely, agreeableness—altruism, empathy, and norm compliance—is linked to courteous and cooperative driving, lessening aggression and competition that cause accidents. Openness—curiosity, creativity, and adaptability—may improve situational awareness and reflective decision-making, along with receptivity to learning and safety. Positive attitudes and intentions, such as cautious road navigation or collaboration, may mitigate these inverse connections. These findings suggest tailored interventions—emotional regulation training for neurotic drivers, cooperative driving campaigns for agreeable people, and proactive safety education for those high in Openness—to improve road safety by leveraging personality traits.

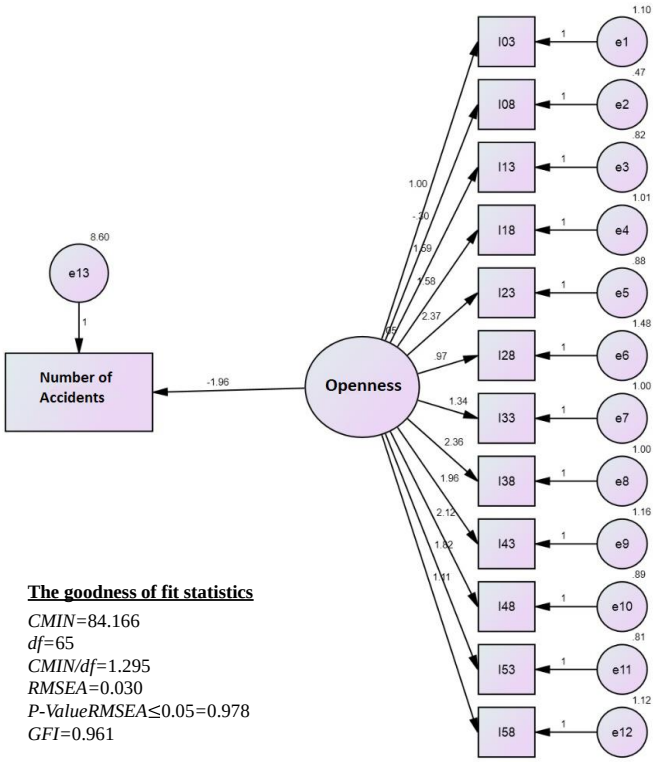

Figure 5. the result of the structural equation model related to the effect of the openness latent variable on the number of accidents

Table 6. the result of the structural equation model related to the effect of the openness latent variable on the number of accidents

Parameter	Estimation	Standard error	t-test	P-value
Variance				
Openness	0.046	0.032	1.450	0.147
e_1	1.099	0.088	12.530	0.000
e_2	0.470	0.037	12.792	0.000
e_3	0.816	0.070	11.719	0.000
e_4	1.013	0.085	11.953	0.000
e_5	0.882	0.084	10.508	0.000
e_6	1.484	0.117	12.632	0.000
e_7	1.002	0.082	12.204	0.000
e_8	1.000	0.093	10.799	0.000
e_9	1.160	0.100	11.640	0.000
e_{10}	0.890	0.081	10.982	0.000
e_{11}	0.808	0.071	11.350	0.000
e_{12}	1.116	0.090	12.459	0.000
e_{13}	8.596	0.677	12.700	0.000
Factor load				
Openness I03→	1.000			
Openness I08→	-0.304	0.264	-1.236	0.216
Openness I13→	1.590	0.625	2.542	0.011
Openness I18→	1.582	0.639	2.475	0.013
Openness I23→	2.366	0.879	2.691	0.007
Openness I28→	0.970	0.519	1.869	0.062

Parameter	Estimation	Standard error	t-test	P-value
Openness I33 →	1.340	0.567	2.362	0.018
Openness I38 →	2.359	0.883	2.671	0.008
Openness I43 →	1.960	0.766	2.560	0.010
Openness I48 →	2.125	0.800	2.655	0.008
Openness I53 →	1.817	0.696	2.611	0.009
Openness I58 →	1.108	0.515	2.152	0.031
Openness → number of accidents	-1.961	1.169	-1.677	0.094

4. Conclusion and Future Directions

Promoting people's culture in road safety depends on understanding two primary principles. Firstly, research in this area requires in-depth study and comprehensive knowledge of the factors affecting safety culture. Another is that promoting a safety culture is a long-term process and requires patience. However, being a long-time process is not a good excuse to stop trying to change the current situation.

Despite the many shortcomings in the country's infrastructure, the lack of proper training for drivers, poor compliance with the law and the poor economic and psychological situation, it is always necessary to examine the factors affecting safety. In recent years, the emphasis of the studies has always been on the human parameter as a major factor in accidents, and researchers are always seeking to understand better the impact of human factors and psychological mechanisms in accidents. There is evidence that personality traits play a significant role in traffic accidents, speeding, and driving anger, according to previous studies [Faílde-Garrido, Rodríguez-Castro, González-Fernández, & García-Rodríguez, 2021; Hasaninasab et al., 2021; Javid, Ali, Abdullah, & Shah, 2021; Mousavi et al., 2021].

Since drivers' behavior has become increasingly important in determining road safety, it is necessary to evaluate drivers' behavior in relation to their personality traits. This study aims to examine the relationship between personality traits and human behavior in relation to the number of accidents in the past five years. The NEO-FFI questionnaire was used in this study in order to identify the psychological personality traits of the drivers. As a result of SEM analysis of 388 samples collected in this study, the following conclusions can be drawn:

Those with a high level of Neuroticism (those who get high scores based on the Neo Personality Traits Questionnaire) are more likely to be anxious, depressed, irritable, and prone to psychological distress. On the other hand, people who score low on Neuroticism, or in other words, do not have Neuroticism, are usually calm, cool, and emotionally stable [Costa Jr & McCrae, 1992; R. R. McCrae, 2002; Rouw & Scholte, 2016]. The variable related to Neuroticism had a positive and significant relationship with the number of accidents.

People with extroverted personality traits are usually lively, cheerful, and sociable, while introverts are laconic, sober, and dignified. Extroverts also have more energy and are intensely inclined towards society [Costa Jr & McCrae, 1992; R. R. McCrae, 2002; Rouw & Scholte, 2016]. The extrovert variable had no significant relation with the number of accidents.

People with openness have curiosity, novelty, ingenuity and artistry, while others are ordinary and realistic. Also, open people are actively looking for new experiences [Costa Jr & McCrae, 1992; R. R. McCrae, 2002; Rouw & Scholte, 2016]. Those with a high level of openness are less likely to be involved in traffic accidents.

Agreeable people are known for traits such as trust and confidence, compassion and humility, and usually prefer compassion and kindness

rather than stubbornness [Costa Jr & McCrae, 1992; R. R. McCrae, 2002; Rouw & Scholte, 2016]. Those with a high level of agreeableness had a negative and significant relationship with the number of accidents.

Conscientious People are regular, punctual, purposeful, and have a degree of perseverance, control, and motivation for their purposeful behavior [Costa Jr & McCrae, 1992; R. R. McCrae, 2002; Rouw & Scholte, 2016]. Those with a high level of conscientiousness did not have a significant relationship with the number of drivers' accidents.

A majority of attempts to reduce traffic accidents focus on road conditions or specific driving behaviors that pose a risk, such as drunk driving and speeding [Yang, Du, Qu, Gong, & Sun, 2013]. Furthermore, it was established that personality traits played a crucial role in the human factor in traffic accidents [Mousavi et al., 2021]. Policymakers and transportation planners could develop appropriate interventions and training courses based on the results of this study. Therefore, self-awareness exercises [Yang et al., 2013], motivational techniques, educational packages, as well as prevention and control measures can be considered appropriate measures for altering some personality traits to some extent in order to improve driver safety behaviors. In order for these measures to be effective, they should be implemented at an early age.

Therefore, an investigation using structural equation modeling on 388 drivers in Tehran revealed clear quantitative connections between personality factors and involvement in traffic accidents over a five-year period. Neuroticism had a significant positive correlation with accidents, as demonstrated by a path coefficient of 1.42 ($p = 0.032$), suggesting that drivers with raised neuroticism scores encountered markedly increased accident chances. In contrast, agreeableness demonstrated a notable negative correlation (path coefficient = -1.59, $p = 0.042$), indicating that more pleasant drivers were less likely to experience accidents. Openness exhibited a marginally significant negative effect (path coefficient = -1.96, $p = 0.094$) at the 90% confidence level, whereas conscientiousness (path coefficient = 0.43, $p = 0.354$) and extraversion (path coefficient = -0.16, $p = 0.826$) demonstrated no statistically significant direct correlations with accident frequency.

The findings highlight the significant influence of neuroticism on accident risk, indicating the potential effectiveness of therapies aimed at stress management or emotional control for drivers with high neuroticism. The protective influence of agreeableness underscores the need of promoting collaborative driving habits. Although openness exhibited a preliminary correlation with decreased accidents, its modest relevance necessitates additional examination. Future study should investigate indirect pathways for conscientiousness and extraversion that may affect accidents through mediating factors such as risk-taking or situational awareness, rather than through direct effects.

Also, it is recommended that future studies explore other theories of personality and personality traits, as well as other psychological factors that contribute to traffic accidents. Moreover, In accordance to a recent study [Niranjan et al., 2022], a combination of naturalistic, self-reported, and simulation studies could provide better insight into the relationships between personality traits and involvement in traffic accidents. Future studies may also examine the effects of the subsets of each personality trait in order to better understand its mechanisms.

Furthermore, although our work offers significant insights, it is crucial to recognize its limitations. The sample, sourced from Tehran residents, may not comprehensively represent other driving demographics or cultural circumstances. Subsequent study may investigate the generalizability of these findings by incorporating more diverse samples. This study also depended on self-reported accident

data, which may be prone to recall bias. Future research may integrate objective assessments of driving behavior and accident statistics to improve the validity of results. Moreover, although our model concentrated on personality, additional factors such as environmental conditions (e.g., weather, road infrastructure) and social influences (e.g., traffic congestion, cultural driving standards) may also significantly impact accident occurrence. Examining the interaction between these contextual elements and personality traits would be a significant direction for future research. Also, future research should investigate the intricate interactions of personality, driving conditions, impairing factors, and real-time behavior using naturalistic studies and simulations to thoroughly comprehend accident probability.
Subsequent research ought to examine the interplay between personality traits and particular driving situations, as well as driver attributes, employing objective metrics to enhance comprehension of the correlation between personality and accidents. Furthermore, research might investigate customized interventions informed by personality profiles to enhance driving safety, such as stress management for individuals exhibiting high levels of Neuroticism.

5. References

-Almlund, Mathilde, Duckworth, Angela Lee, Heckman, James, & Kautz, Tim. (2011). Personality psychology and economics. In Handbook of the Economics of Education (Vol. 4, pp. 1-181): Elsevier.

-Argandar, Gabriel Dorantes, Gil, Francisco Tortosa, & Berlanga, Javier Ferrero. (2016). Measuring situations that stress Mexicans while driving. Transportation research part F: traffic psychology and behaviour, 37, 154-161.

-Arthur Jr, Winfred, & Graziano, William G. (1996). The five-factor model, conscientiousness, and driving accident involvement. Journal of personality, 64(3), 593-618.

-Baran, Paulina, Zieliński, Piotr, & Dziuda, Łukasz. (2021). Personality and temperament traits as predictors of conscious risky car driving. Safety science, 142, 105361.

-Bollen, Kenneth A. (1989). Structural equations with latent variables (Vol. 210): John Wiley & Sons.

-Cellar, Douglas F, Nelson, Zachary C, & Yorke, Candice M. (2000). The five-factor model and driving behavior: Personality and involvement in vehicular accidents. Psychological reports, 86(2), 454-456.

-Chrisnatalia, Maria, Dian Kemala Putri, and Stephanus Benedictus Bera Liwun, (2023). The influence of personality type on the risk of driving. INSPIRA: Indonesian Journal of Psychological Research 4, no. 2, 111-122.

-Clapp, Joshua D, Olsen, Shira A, Danoff-Burg, Sharon, Hagewood, J Houston, Hickling, Edward J, Hwang, Vivian S, & Beck, J Gayle. (2011). Factors contributing to anxious driving behavior: The role of stress history and accident severity. Journal of anxiety disorders, 25(4), 592-598.

-Clarke, Sharon, & T Robertson, Ivan. (2005). A meta-analytic review of the Big Five personality factors and accident involvement in occupational and non-occupational settings. Journal of Occupational and Organizational psychology, 78(3), 355-376.

-Costa Jr, Paul T, & McCrae, Robert R. (1992). Revised NEO personality inventory (NEO-PI-R) and NEO five-factor (NEO-FFI) inventory professional manual. Odessa, Fl: PAR.

-Costa Jr, Paul T, & McCrae, Robert R. (2008). The Revised Neo Personality Inventory (neo-pi-r): Sage Publications, Inc.

-Costa, Paul T, & McCrae, Robert R. (1989). NEO PI/FFI manual supplement for use with the NEO Personality Inventory and the NEO Five-Factor Inventory: Psychological Assessment Resources.

-Digman, John M. (1990). Personality structure: Emergence of the five-factor model. Annual review of psychology, 41(1), 417-440.

-Dogan, Daghan, Bogosyan, Seta, & Acarman, Tankut. (2019). Evaluation of driver stress level with survey, galvanic skin response sensor data, and force-sensing resistor data. Advances in Mechanical Engineering, 11(12), 1687814019891555.

-Dula, Chris S, Adams, Cristi L, Miesner, Michael T, & Leonard, Robin L. (2010). Examining relationships between anxiety and dangerous driving. Accident Analysis & Prevention, 42(6), 2050-2056.

-Elander, James, West, Robert, & French, Davina. (1993). Behavioral correlates of individual differences in road-traffic crash risk: An examination of methods and findings. Psychological bulletin, 113(2), 279.

-Faílde-Garrido, José María, Rodríguez-Castro, Yolanda, González-Fernández, Antonio, & García-Rodríguez, Manuel Antonio. (2021). Traffic Crimes and risky driving: The role of personality and driving anger. Current Psychology, 1-15.

-Găianu, Pantilimon-Alexandru, Cezar Giosan, and Paul Sârbescu, (2024). Personality traits and traffic violations: the serial mediating role of theory of planned behavior constructs and intention. South African Journal of Psychology 54, no. 2, 260-273.

-Goldberg, Lewis R. (1993). The structure of phenotypic personality traits. American psychologist, 48(1), 26.

-Hair Jr, Joseph F, Hult, G Tomas M, Ringle, Christian M, Sarstedt, Marko, Danks, Nicholas P, & Ray, Soumya. (2021). Partial least squares structural equation modeling (PLS-SEM) using R: A workbook. In: Springer Nature.

-Haghdoust, Zahra, Gholamreza Masoumi, Davoud Khorasani Zavareh, Abbas Ebadi, and Shandiz Moslehi (2022). A systematic literature review of driver's sociocultural factors predisposing to road traffic crashes. Medical journal of the Islamic Republic of Iran 36, 21.

-Hale, Andrew R, & Glendon, A Ian. (1987). Individual behaviour in the control of danger: Elsevier Science.

-Hansen, Curtiss P. (1988). Personality characteristics of the accident involved employee. Journal of Business and psychology, 2(4), 346-365.

-Hasaninasab, Shahab, Jalili, Sajjad, & Mirani, Katayoun. (2021). Evaluation effects of personality on the young people traffic offense and accident. Iranian Journal of Science and Technology, Transactions of Civil Engineering, 45(1), 491-503.

-Hasaninasab, Shahab, Jalili, Sajjad. & Zahedi, Mohsen. (2022). Predicting personality preferences and high-risk driving behaviors affecting the number of traffic accidents. Journal of Transportation Research, 19(1), 129-140.

-Javid, Muhammad Ashraf, Ali, Nazam, Abdullah, Muhammad, & Shah, Syed Arif Hussain. (2021). Integrating the Norm Activation Model (NAM) Theory in Explaining Factors Affecting Drivers' Speeding Behaviour

in Lahore. KSCE Journal of Civil Engineering, 25(7), 2701-2712.

-Keehn, JD. (1961). Accident tendency, avoidance learning and perceptual defence. Australian journal of psychology, 13(2), 157-169.

-Lawton, Rebecca, & Parker, Dianne. (1998). Individual differences in accident liability: A review and integrative approach. Human Factors, 40(4), 655-671.

-Lee, Jonghak, Chae, Junghyo, Yoon, Taekwan, & Yang, Hojin. (2018). Traffic accident severity analysis with rain-related factors using structural equation modeling–A case study of Seoul City. Accident Analysis & Prevention, 112, 1-10.

-Lemke, Michael, & Apostolopoulos, Yorghos. (2015). Health and wellness programs for commercial motor-vehicle drivers: organizational assessment and new research directions. Workplace health & safety, 63(2), 71-80.

-Lester, Julia. (1991). Individual differences in accident liability: A review of the literature.

-Lomax, Richard G. (1982). A guide to LISREL-type structural equation modeling. Behavior Research Methods & Instrumentation, 14(1), 1-8.

-Lomax, Richard G. (1983). A guide to multiple-sample structural equation modeling. Behavior Research Methods & Instrumentation, 15(6), 580-584.

-Luo, Xiaohui, Yan Ge, and Weina Qu, (2023). The association between the Big Five personality traits and driving behaviors: A systematic review and meta-analysis. Accident Analysis & Prevention 183, 106968.

-Mamcarz, Piotr, Droździel, Paulina, Madleňáková, Lucia, Sieradzki, Andrzej, & Droździel, Paweł. (2019). Level of occupational stress, personality and traffic incidents: Comparative study of public and freight transport drivers. Transportation Research Procedia, 40, 1453-1458.

-McCrae, Robert R. (2002). Cross-cultural research on the five-factor model of personality. Online readings in psychology and culture, 4(4), 1-12.

-McCrae, Robert R, & Costa Jr, Paul T. (2004). A contemplated revision of the NEO Five-Factor Inventory. Personality and individual differences, 36(3), 587-596.

-McCrae, Robert R, & Costa, Paul T. (2003). Personality in adulthood: A five-factor theory perspective: Guilford Press.

-McCrae, RR, & Costa Jr, PT. (1990). Personality in adulthood New York: Guilford. McCraePersonality in adulthood1990.

-Moradi, Ali, Nazari, Seyed Saeed Hashemi, & Rahmani, Khaled. (2019). Sleepiness and the risk of road traffic accidents: A systematic review and meta-analysis of previous studies. Transportation research part F: traffic psychology and behaviour, 65, 620-629.

-Mousavi, Seyed Mohammad, Moradi, Elnaz Vafadar, Yazdani, Ali, Taghipour, Ali, Rezaei Ardani, Amir, & Sadrzadeh, Sayyed Majid. (2021). The Relation between Human Traffic Accident and Personality Traits. Archives of Trauma Research, 10(3), 161-164.

-Niranjan, Suman, Gabaldon, Janeth, Hawkins, Timothy G, Gupta, Vishal K, & McBride, Maranda. (2022). The influence of personality and cognitive failures on distracted driving behaviors among young adults. Transportation

research part F: traffic psychology and behaviour, 84, 313-329.

-Pestonjee, DM, & Singh, UB. (1980). Neuroticism-extraversion as correlates of accident occurence. Accident Analysis & Prevention, 12(3), 201-204.

-Pereira, Vijay, Umesh Bamel, Happy Paul, and Arup Varma, (2022). Personality and safety behavior: An analysis of worldwide research on road and traffic safety leading to organizational and policy implications. Journal of Business Research 151, 185-196.

-Rouw, Romke, & Scholte, H Steven. (2016). Personality and cognitive profiles of a general synesthetic trait. Neuropsychologia, 88, 35-48.

-Rowden, Peter, Matthews, Gerald, Watson, Barry, & Biggs, Herbert. (2011). The relative impact of work-related stress, life stress and driving environment stress on driving outcomes. Accident Analysis & Prevention, 43(4), 1332-1340.

-Scott-Parker, Bridie, Jones, Christian M, Rune, Karina, & Tucker, Joel. (2018). A qualitative exploration of driving stress and driving discourtesy. Accident Analysis & Prevention, 118, 38-53.

-Sümer, Nebi, Lajunen, Timo, & Özkan, Türker. (2005). Big five personality traits as the distal predictors of road accident. Traffic and transport psychology: Theory and application, 215, 215-227.

-Ulleberg, Pål, & Rundmo, Torbjørn. (2003). Personality, attitudes and risk perception as predictors of risky driving behaviour among young drivers. Safety science, 41(5), 427-443.

-Washington, Simon, Karlaftis, Matthew, Mannering, Fred, & Anastasopoulos, Panagiotis. (2020). Statistical and econometric methods for transportation data analysis: Chapman and Hall/CRC.

-Wei, Chien-Hung, Lee, Ying, Luo, Yu-Wen, & Lu, Jyun-Jie. (2021). Incorporating personality traits to assess the risk level of aberrant driving behaviors for truck drivers. International journal of environmental research and public health, 18(9), 4601.

-WHO. (2009). Global status report on road safety: time for action. Retrieved from WHO. (2018a).

-Global status report on road safety 2018. Retrieved from WHO. (2018b).

-Global status report on road safety 2018: summary. . Retrieved from WHO. (2021). Road traffic injuries. Retrieved from https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries

-Yang, Jiaoyan, Du, Feng, Qu, Weina, Gong, Zhun, & Sun, Xianghong. (2013). Effects of personality on risky driving behavior and accident involvement for Chinese drivers. Traffic injury prevention, 14(6), 565-571.