

Personality, Driving Behavior and Mental Disorders Factors as Predictors of Road Traffic Accidents Based on Logistic Regression

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Received: 12 September 2015

Revised: 07 December 2015

Accepted: 17 January 2016

What's Known

- Human factors play a major role in causing accidents around the world. Previous studies have revealed that mental disorders such as depression or anxiety increase the risk of road accidents.

What's New

- The results of the present cohort study showed that mental disorders affect driving behavior and the incidence of road collisions. Considering the importance and sensitivity of driving behavior, it is necessary to evaluate multiple psychological factors influencing drivers before and after receiving or renewing their driver's license. This would improve driving behavior and reduce the risk of accidents. neurotrophic factor exons III, IV and IX but not the exon I in the hippocampi of rats.

Abstract

Background: The aim of this study was to evaluate the effect of variables such as personality traits, driving behavior and mental illness on road traffic accidents among the drivers with accidents and those without road crash.

Methods: In this cohort study, 800 bus and truck drivers were recruited. Participants were selected among drivers who referred to Imam Sajjad Hospital (Tehran, Iran) during 2013-2015. The Manchester driving behavior questionnaire (MDBQ), big five personality test (NEO personality inventory) and semi-structured interview (schizophrenia and affective disorders scale) were used. After two years, we surveyed all accidents due to human factors that involved the recruited drivers. The data were analyzed using the SPSS software by performing the descriptive statistics, t-test, and multiple logistic regression analysis methods. P values less than 0.05 were considered statistically significant.

Results: In terms of controlling the effective and demographic variables, the findings revealed significant differences between the two groups of drivers that were and were not involved in road accidents. In addition, it was found that depression and anxiety could increase the odds ratio (OR) of road accidents by 2.4- and 2.7-folds, respectively (P=0.04, P=0.004). It is noteworthy to mention that neuroticism alone can increase the odds of road accidents by 1.1-fold (P=0.009), but other personality factors did not have a significant effect on the equation.

Conclusion: The results revealed that some mental disorders affect the incidence of road collisions. Considering the importance and sensitivity of driving behavior, it is necessary to evaluate multiple psychological factors influencing drivers before and after receiving or renewing their driver's license.

Please cite this article as: Alavi SS, Mohammadi MR, Souri H, Mohammadi Kalhori S, Jannatifard F, Sepahbodi G. Personality, Driving Behavior and Mental Disorders Factors as Predictors of Road Traffic Accidents Based on Logistic Regression. *Iran J Med Sci*. 2017;42(1):24-31.

Keywords • Accidents • Human factors • Mental disorders • Bus and truck drivers • Personality • Automobile driving

Introduction

Road accidents and the related mass casualties are one of the challenges of the human society that threaten the health of people and impose huge costs on the states.^{1,2} Developed countries have the largest number of victims due to road accident and is considered as one of the main causes of death. The degree of injuries and the frequency of major road

accidents are to such extent that it is called the "war on the roads".¹

According to the statistics, on average, 10% of the injuries lead to death³ and about 3,000 people are killed per day due to traffic accidents around the world.⁴ Similar to other human factors, the behavior of a driver is influenced by conscious and unconscious factors called "cognitive-behavioral characteristics". Based on a study, driving errors (i.e. human factors) are responsible for 93% of traffic accidents, 34% due to operational deficiencies, and 12% due to vehicle malfunctions. The results confirm reports that indicate the role of human factors (individual or social) in road accidents.⁵ Moreover, other studies have highlighted the role of driver's personality and visibility in driving behavior. According to past research studies, drivers that cause accident are distinguished from other drivers by factors such as empathy, characteristics, stress level, and few other parameters.^{6,7}

An analysis of the road accidents in Iran also revealed several factors for such occurrences. Pakgouhar et al.⁸ showed that the contribution of human factors to road accidents is 97.5% and the role of human factors in causing an accident is 49%. In their research, Hassanpour et al.⁹ found that human factors are one of the most important causes of driving accidents in Iran (more than 30% of accidents and 23% of driving losses). Moreover, Refahi et al.¹⁰ stated that the role of attitude in driving behavior is more important than other aspects. Consistent with their opinion, there was an indirect association between variables such as personality traits and driving behavior.

In general, human factors that are involved in road accidents are categorized into two general classifications, namely cognitive-behavioral factors and behavioral factors. For the latter, "behavioral" corresponds to the contributing factors (e.g. infringement of driving laws, driving at high speed while feeling dizzy and fatigued, drug or alcohol use) in causing a road accident.¹¹ While recognizing the adverse effect of road conditions and vehicle health in causing accidents, researchers have hypothesized that the effect of human factors is omitted and should be investigated. The discarded factors are personality traits (based on the big five personality traits), driving behavior, and mental disorders (based on the diagnostic interview).

This study was conducted to evaluate the specific hypothesis that the cognitive-behavioral factors and mental disorders can predict road accidents. The aim of this cohort study was to identify the psychological factors that influence road accidents. In addition, we compared driving behavior and its subscales in two groups of

drivers with accidents and those without road crash. Due to increased fatalities¹² and an upsurge in road trips in Iran, our country is also not immune from road accidents. Consequently, designing appropriate models to identify factors affecting road crashes deemed necessary.

Participants and Methods

Participants and Procedure

In this cohort study, 800 bus and truck drivers were recruited among those referred to Imam Sajjad Hospital (Tehran, Iran) during October 2013 to May 2015. These drivers referred to the hospital for a drug test, as a medical prerequisite for renewing their driver's license. As a profession, they were heavy vehicle drivers and were holding category C or D driver's license. We intentionally targeted heavy vehicle drivers since they are in high-risk accident category compared to other drivers.

Convenience sampling, a non-probability sampling technique, was used in this study. Initially, under the supervision of interviewers, the participants were encouraged to fill in the questionnaire forms. This was followed by a semi-structured interview (schizophrenia and affective disorders scale [SADS]) by a clinical psychologist to diagnose any mental disorders. The questionnaires comprised of demographic questions, Manchester driving behavior questionnaire (MDBQ), NEO personality inventory, and smoking and substance abuse inventory. The inclusion criteria were male drivers, holders of category C or D driver's license, age range 23-85 years and being referred to Imam Sajjad Hospital. The exclusion criteria were female drivers, suffering from severe mental disorders (e.g. chronic psychosis or dementia), and illiteracy or uneducated drivers unable to understand the questions. The recruits were then followed-up over a two-year timeframe. We ensured that the participants regularly drove heavy vehicles during that period. Then, based on police accident reports, we identified those drivers that were involved in a driving accident due to human factors.

The Demographic Questionnaire

The demographic questions consist of participants' age, education, history of driving, the amount of kilometers traveled per month, marital status, time taken to obtain driver's license, and the number of occurred accidents caused by human factors.

Manchester Driving Behavior Questionnaire (MDBQ)

This scale was adjusted and compiled by Rissen et al.¹³ in the Psychology Department

of Manchester University, Manchester, UK. It is based on the idea that errors and violations have different psychological reasons and correction methods; hence, they should be discriminated by researchers. Nowadays, MDBQ is being used as a popular instrument to assess driving behaviors. This questionnaire contains 50 questions with Likert scale range from 0 to 5. The questions cover two different aspects; the kind of behavior and the amount of risk posed to other drivers. Abnormal behaviors are lapse errors, slips, deliberate violation, and unintentional violation. These behaviors are classified as follows:

1. Behaviors that pose no risk to others and merely give a feel of comfort (low-risk probability)
2. Behaviors that are likely to put others at risk (moderate-risk probability)
3. Behaviors that certainly put others at risk (high-risk probability).

MDBQ has acceptable psychometric properties. Parker et al.¹⁴ obtained a correlation coefficient of 0.81 for errors and 0.75 for violations in another reliability research conducted on 80 drivers with a 7-week interval. Iliescu and Sârbescu¹⁵ reported that the reliability of MDBQ factors is from 0.62 to 0.78, which is satisfactory. They regarded the MDBQ as a valid and reliable tool for assessing driving behavior. Moreover, Oreizi¹⁶ reported that the Iranian version of MDBQ has acceptable reliability and validity. In their study, the reliability of the factors ranged from 0.65 to 0.81.

Big Five Personality Test (NEO Personality Inventory)

Paul Costa (1985) designed this questionnaire as a short form of the NEO personality inventory. This scale contains 60 items and is scored from 0 to 4. Each question inquired about one of the main five personality dimensions, including neuroticism (N), extraversion (E), openness to experience (O), agreeableness (A), and conscientiousness (C), respectively. Each of the factors covered 12 questions and each scale scored from 0 to 48.¹⁷

The validity and reliability of the Persian version of NEO personality inventory have been confirmed in various studies. Yadollahi et al.¹⁸ noted that the short form of NEO has acceptable reliability (Cronbach α between 0.69-0.83).

Smoking and Substance Abuse Questionnaire

This questionnaire consists of 12 items, with five-point Likert spectrum, and it surveys the dosage of the drugs, stimulants, hallucinogens, and alcohol during the past year. Rahimi-Movaghar et al.¹⁹ reported that this questionnaire

has acceptable reliability and validity. In their study, its inter-rater reliability was evaluated in persons from the general population. It showed a good reliability for smoking and alcohol use.

Psychiatric Interview (SADS)

Clinical psychologists conducted the semi-structured interview to diagnose any mental disorder in drivers. This interview evaluated 16 main psychology and psychiatric disorders and other psychiatric disorders, including psychiatric problems, depression, mania, hypomania, substance abuse and addiction, psychosis, anxiety disorders, antisocial personality, somatization disorders, suicidal thoughts, post-traumatic stress disorders (PTSD), dissociative disorders, epilepsy disorder, Alzheimer, and mental retardation.

The validity and reliability of SADS have been reported in several research studies. Simpson et al.²⁰ reported that Cohen's Kappa coefficient of mania, hypomania and depression was calculated as 0.83, 0.72 and 1, respectively. Mohammadi et al.²¹ showed that the Iranian version of SADS has acceptable validity and reliability. The diagnostic interviews were performed by clinical psychologists that had been educated in the field of diagnosis and treatment of mental disorders.

Data were analyzed using the statistical package for social sciences (SPSS) version 18.0. In addition, descriptive statistics were used to demonstrate demographic data. To compare driving behavior and its subscales, we performed *t* test analysis. The effective factors that contribute to road crashes were determined using multiple logistic regression analysis. P values less than 0.05 were considered as statistically significant.

To analyze the data, all variables including personality traits, mental disorders, and demographic characteristics that were collected through questionnaires and were likely to have an impact on road accidents were identified. The logistic regression analysis was conducted for each variable in the univariable analysis and crude OR was also estimated. In the next step, variables with P values <0.2 were selected and entered into the multiple logistic regression analysis. Then, those variables that had a significant role in the model with P values <0.05 were interpreted with adjusted OR.

Results

Eight hundred drivers participated in this cohort study. Their age ranged from 24 to 81 years with an average age of 46.7±11.17 years (mean±SD).

The majority of the 654 drivers (81.7%) were married, 730 (91.2%) had a secondary school education or less, and 70 (8.8%) were college graduates. Table 1 summarizes a few characteristics of the samples based on the demographic questionnaires.

Table 2 shows the mean, standard deviation, and comparison of the driving behavior and its subscales between the two groups of drivers with road accidents and without road crash. The *t* test analysis indicated that the two groups differed significantly in terms of driving behavior and all its dimensions such as slips, deliberate violation, laps error, and unintentional violation ($P < 0.05$).

The findings of this study revealed that age reduced the risk of accident occurrence (positive

effect), indicating that by per year increase in age, the odds of accident occurrence was reduced by 0.01-fold. In addition, we found that driving history also reduced the risk of accidents (positive effect), meaning that by per year increase in driving history, the odds of accident occurrence were reduced by 0.05-fold. Based on the multiple logistic regression interpretations (multivariable analysis), accident history had no impact on the risk of accident occurrence (Table 3).

The results revealed that depression, in three levels of minor, mild and major, increased the odds of road accidents by 2.4-fold. Furthermore, with regard to anxiety disorders, particularly obsession disorder, the results revealed that this disorder increased the odds of road accidents by 2.7-fold. PTSD and driving behavior were not significant parameters in the equation; and among the personality traits, neuroticism was more likely to increase crash probability by 1.1-fold, but other personality factors did not seem to have a significant effect on the risk of accident occurrence. Moreover, since none of the drivers mentioned any disorders, such as smell or vision delusion, psychosis symptoms, epilepsy, mania, hypomania, panic disorder, phobia, fugue, or other mental problems, we therefore did not enter any of these disorders into the equation.

Table 1: Summary of demographic information from 800 bus and truck examinees

Variable	Number	Frequency (%)
Age (years)		
≤30	87	10.9
31-40	160	20
41-50	232	29
51-60	247	30.9
61-70	65	8.1
71-80	8	1
Marital status		
Married	654	81.7
Single	146	18.3
Educational level		
Diploma or less	730	91.2
College education	70	8.8
Driving history*		
1-10 years	185	23.4
11-20	224	28.3
21-30	230	29
31 years or more	153	19.3
Number of accidents (history of accident)		
1	132	16.6
2	72	9
3	27	3.4
4	13	1.6
5	8	1
6	1	0.1
7	1	0.1
8	1	0.1
The number of accidents that samples were at fault		
1	122	15.2
2	39	4.9
3	6	0.8
4	1	0.1
5	2	0.2

*Driving history: Number of years of driving per person

Discussion

The aim of this cohort study was to identify the possible impact of personality traits, some mental illnesses, and driving behavior of bus and truck drivers on the risk of road accidents. For this purpose, we recruited 800 professional drivers and conducted questionnaire accompanying interviews. After two years of follow-up, we surveyed those samples that had road accidents due to human factors.

Based on the results of this study, older age reduces the occurrence of accidents (positive effect), which means that per year of age the odds of accident occurrence is reduced by 0.01-fold. Some other research studies also signified the role of age in road accidents. For example, in a substantial research done by Heidari et al.,²² they reported that there was a significant relationship between age and all the errors and infringements of driving. The risk of driving violations is higher in youths aged 18-25 years old, as this age range is one of important risk factors for road accidents. On the other hand, Mehmandar et al.²³ argued that older age and other demographic properties such as a university degree and female gender seem to be the most vital risk factors in road accidents that lead to fatalities in Iran. Clearly,

Table 2: The mean, standard deviation, and comparison of driving behavior and its subscales between the two groups of drivers with accidents and without road crash

Driving behavior and its subscales	Accident history	N	Mean±SD	t	df	P value	95% confidence interval of the difference	
							Lower	Upper
Driving behavior*		530	14.98±12.62	-5.37	774	<0.001	-7.21	-3.35
	Yes	247	20.27±13.06					
Slips	No	534	6.93±6.38	-5.047	779	<0.001	-3.42	-1.50
	Yes	248	9.40±6.30					
Deliberate violation	No	537	4.91±5.00	-3.009	786	0.003	-1.93	-0.40
	Yes	252	6.08±5.32					
Laps error	No	537	2.05±2.21	-5.91	787	<0.001	-1.38	-0.69
	Yes	253	3.09±2.49					
Unintentional violation	No	542	1.25±1.56	-3.08	792	0.002	-0.60	-0.13
	Yes	253	1.62±1.59					

*Driving behavior: Scores of driver's driving behavior

Table 3: Multiple logistic regression-independent predictors of road accident in truck and bus drivers (n = 800)

Variables	Univariable analysis			Multivariable analysis		
	OR (crude)	CI (95%)	P value	OR (adjusted)	CI (95%)	P value
Age	0.98	0.97-0.99	0.008	0.99*	0.96-0.99	0.05
Driving history	0.97	0.94-1.1	0.07	0.95*	0.91-0.98	0.05
History of accident	19.28	12.1-30.8	<0.001	0.87	0.68-1.1	0.29
Depression	3.4	1.3-8.9	0.01	2.4*	1.2-6.6	0.04
Obsession	2.1	0.68-6.7	0.18	2.7*	2.7-19.4	0.004
PTSD	2.4	0.93-6.4	0.07	2.1	0.56-7.4	0.27
Driving behavior	1.1	1.05-1.1	<0.001	1.1	0.99-1.3	0.14
Neuroticism	1.05	1.05-1.1	0.003	1.1*	1.01-1.13	0.009

driving is a complex activity and includes cognitive, visual, and bodily processes.²⁴ Hence, driving could be adversely affected by factors such as age and mental illness that can affect cognitive processes involved with driving. Therefore, it can be stated that older people are more prudent and less likely to be involved in a road accident.²⁵ Moreover, the ability to drive safely and skillfully is a process that takes 8 to 9 years.²⁶ The results of our study suggest that it will take several years for a novice driver to turn into an experienced driver. To clarify the relationship between age and reduction in the occurrence of traffic accidents, we can state that older people are more experienced and cautious than young drivers. Awareness of mental and physical limitations is more realistic in older drivers, so they exhibit self-control behavior that leads to a better risk estimation while driving.

The results revealed that driving history could reduce the likelihood of accidents (positive effect), meaning that as driving experience is enhanced every year and as a driver reaches an older age, the chance of an accident will reduce. In other research studies, it is stated that compared with a history of car accidents, the duration of a driver's license is more associated

with the reduced risk of accidents due to human factors; and more experience is associated with reduced accidents.^{14,27} This item can be correlated with more skilled elderly compared with young people.^{28,29}

Based on the results of a study, having visited a psychiatrist or psychologist did not affect the risk of accident occurrence. This result is in contrast with those of previous research studies; for instance, a study noted that tired, mindless, careless and anxious drivers experience difficulty while driving and they sometimes exhibit risky driving behavior.³⁰ In another study, it was mentioned that patients with psychiatric disorders had twice as many accidents compared with a control group.³¹ The inconsistency between our results and those of the previous studies could be due to the utilization of different sample groups and diagnostic tools. In Iran, referring to a psychologist or psychiatrist is occasionally considered taboo, which in turn could negatively affect the results.

The preliminary results revealed that depression in three levels of minor, major and mild was a predictor of an accident and increased the odds of accidents by as much as 2.4-fold. In a similar research, it was found that risky driving

behavior is associated with sensation seeking, lack of tolerance, stress intolerance, impulsivity, violence, emotional instability, adventure, depression and pessimistic thoughts.²⁷ Another research found a positive and robust correlation between depression and risky driving behavior, especially in injury accident and driving while intoxicated. Da Silvia-Junior et al.³² noted that truck drivers were more susceptible to depression in comparison with the general population and depression prevalence among them was 13.6%. This was also confirmed in a study by Shen et al.³¹ Other studies mentioned that patients who suffer from psychiatric illnesses (such as depression or anxiety) have a double accident versus a control group.³¹

The results revealed that mania and hypomania, as well as a history of psychiatric problems, did not increase or decrease the risk of accidents. Therefore, it can be concluded that these results arise from the lack of proper sample size or the absence of mania or hypomania symptoms in the sample group.

In anxiety disorders spectrum, especially obsession disorder, the results demonstrated that obsession disorders increased the odds of accidents by 2.7-fold in truck and bus drivers. Previous reports demonstrated that a significant correlation was found between neurosis such as anxiety and depression with road crashes.³³ However, in other research, significant differences were reported between the scores of paranoid thoughts, obsessive and compulsive behavior, and interpersonal sensitivity in both groups of drivers with and without road accidents.³⁴ Asghari et al.³⁵ reported that there was a negative correlation between anxiety and driving psychology. They concluded that anxiety and aggression have a negative impact on traffic psychology.

Overall, it can be assumed that mental health is one of the variables that has been investigated in aggressive behaviors of drivers. It is believed that persons, who suffer from mental disorders, may jeopardize the health of themselves and others with their driving behavior. Based on our findings, among the personality traits, only neuroticism increased the risk of accidents and other personality traits were not significant in the logistic regression equation. These findings are consistent with studies by Wang, Rau, and Solvency. They emphasized the role of vision and personality factors in road accidents.⁶ Another research also showed a positive correlation between the neuroticism index with a variety of errors and illegal acts in driving behavior, which confirms the results of this study.⁷ Moreover, a large

study, which was conducted in 34 countries indicated that there was a negative correlation between neuroticism and traffic fatalities.³⁶

In another study, no positive relationship was found between aggressive driving and extroversion or sensation seeking.¹³ On the other hand, Fyhri and Backer-Grøndahl reported that "agreeableness" was also negatively correlated with the risk of accident.³⁷ Dahlen and White noted that "conscientiousness" is also negatively associated with risky driving³⁸ or is correlated with aggressive driving,³⁹ which is inconsistent with our results.

The inconsistency between our results and those in the above-mentioned studies could be due to different populations, personality types, and the effect of other variables such as age, environmental factors, and history of driving. In one of the studies, the participants were young drivers whereas in our study the drivers were selected from all age ranges, which could have affected our results.

It should be noted that the complexity of human behavior stems from various factors such as cultural, educational, economic, social factors and mental health,⁴⁰ which can affect the driving behavior of truck and bus drivers and may play an essential role in shaping their behavior.

There were several limitations in this study. First, data were collected over a very short period of time (2 years) and administering the questionnaires (MDBQ and NEO) had certain constraints. Second, the procedure for selecting the samples did not allow us to generalize the results to other populations such as those holding category A and B driver's licenses.

Conclusion

The two main factors in the incidence of traffic accidents are the human factors and patterns of driving behavior. In this study, it was observed that the underlying factors of traffic accidents were human, cognitive, and behavioral factors such as mental illness, personality, or the age of drivers. Using the results of this study, we can control the percentage of road accidents in drivers holding category D and C driver's licenses. In addition, by introducing necessary changes in the process of obtaining a driver's license (e.g. performing a psychological test) we can guide drivers to shape a safe driving behavior. The strengths of this study were its cohort study design and diagnostic interview of all participants to diagnose mental disorders. Since it has yet to be established whether the quality of road and vehicles are the cause of road crashes, researchers need to conduct

longitudinal research on road accidents and perform the psychological tests precisely.

Acknowledgment

This research has been supported by Tehran University of Medical Sciences and Health Services grant 20532.

Conflict of Interest: None declared.

References

1. Roberts I, Mohan D, Abbasi K. War on the roads. *BMJ*. 2002;324:1107-8. PubMed PMID: 12003866; PubMed Central PMCID: PMC1123075.
2. Evans L. Twenty thousand more Americans killed annually because US traffic-safety policy rejects science. *Am J Public Health*. 2014;104:1349-51. doi: 10.2105/AJPH.2014.301919. PubMed PMID: 24922140; PubMed Central PMCID: PMC4103206.
3. Bener A, Verjee M, Dafeeah EE, Yousafzai MT, Mari S, Hassib A, et al. A cross "ethnic" comparison of the Driver Behaviour Questionnaire (DBQ) in an economically fast developing country. *Glob J Health Sci*. 2013;5:165-75. doi: 10.5539/gjhs.v5n4p165. PubMed PMID: 23777732; PubMed Central PMCID: PMC4776840.
4. López AD, Murray CJ. *The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and Risk Factors in 1990 and Projected to 2020*. Boston: Harvard School of Public of Public Health; 1996.
5. Nikzad M. *Traffic accidents and damage caused by it, Causes and ways out of them*. Tehran: Applied Research Office of Traffic Police, 2008. Persian.
6. Wang P, Rau PL, Salvendy G. Road safety research in China: review and appraisal. *Traffic Inj Prev*. 2010;11:425-32. doi: 10.1080/15389581003754593. PubMed PMID: 20730690.
7. Ledesma RD, Montes SA, Poo FM, Lopez-Ramon MF. Individual differences in driver inattention: the attention-related driving errors scale. *Traffic Inj Prev*. 2010;11:142-50. doi: 10.1080/15389580903497139. PubMed PMID: 20373233.
8. Pakgohar A, Saffarzadeh M, Khalili M. The survey role of humanistic factor in incidence and intensity of road accident based on Logistic Regression and CART. Tehran: Applied Research Office of Traffic Police. 2008. Persian.
9. Hasanpour S, Asadolahi R, Zabihi e Tari M, editors. *The survey statistics of accident in pedestrian based on effective Parameters*. Tehran: The first national conference on Traffic and Safety. 2011. Persian.
10. Refahi Z, Rezaei A, Aganj N, Birgani R. Investigation of Psychological-Social Factors Predicative of Traffic Accidents in Shiraz City. *Journal of Life Sciences and Biomedicine*. 2012;2:243-51.
11. Arnau Sabates L, Filella Guiu G, Jariot Garcia M, Montane Capdevila J. Evaluation of a program for changing attitudes in pre-drivers to prevent road accidents related to drink-driving in Catalonia. *Adicciones*. 2011;23:257-65. PubMed PMID: 21814714.
12. Lankarani KB, Sarikhani Y, Heydari ST, Joulaie H, Maharlouei N, Peimani P, et al. Traffic accidents in Iran, a decade of progress but still challenges ahead. *Med J Islam Repub Iran*. 2014;28:96. PubMed PMID: 25664297; PubMed Central PMCID: PMC4301220.
13. Bergomi M, Vivoli G, Rovesti S, Bussetti P, Ferrari A, Vivoli R. [Role of some psychophysiological factors on driving safety]. *Ann Ig*. 2010;22:387-400. PubMed PMID: 21384686.
14. Parker D, West R, Stradling S, Manstead AS. Behavioural characteristics and involvement in different types of traffic accident. *Accid Anal Prev*. 1995;27:571-81. PubMed PMID: 7546068.
15. Iliescu D, Sarbescu P. The relationship of dangerous driving with traffic offenses: A study on an adapted measure of dangerous driving. *Accid Anal Prev*. 2013;51:33-41. doi: 10.1016/j.aap.2012.10.014. PubMed PMID: 23182781.
16. Oreizi HR, Haghayegh SA. Psychometric properties of the Manchester Driving Behavior Questionnaire. *Payesh*. 2010;9:21-8. Persian.
17. Haghshenas H. *Big five factor of personality properties*. Shiraz: Shiraz University of Medical Sciences. 2009. Persian.
18. Yadollahi P, Khalaginia Z, Vedadhir A, Ariashekouh A, Taghizadeh Z, Khormaei F. The study of predicting role of personality traits in the perception of labor pain. *Iran J Nurs Midwifery Res*. 2014;19:S97-S102. PubMed PMID: 25949260; PubMed Central PMCID: PMC4402982.
19. Rahimi-Movaghar A, Amin-Esmaeili M, Sharifi V, Hajebi A, Radgoodarzi R, Hefazi M, et al. Iranian mental health survey: design and field proced. *Iran J Psychiatry*.

- 2014;9:96-109. PubMed PMID: 25632287; PubMed Central PMCID: PMC4300472.
20. Simpson SG, McMahon FJ, McInnis MG, MacKinnon DF, Edwin D, Folstein SE, et al. Diagnostic reliability of bipolar II disorder. *Arch Gen Psychiatry*. 2002;59:736-40. PubMed PMID: 12150650.
 21. Mohammadi M, Davidian H, Noorbala A, Malekafzali H, Naghavi H, Pouretamad H. The epidemiology of mental disorders in Iran. *Hakim Research Journal*. 2002;6:55-64.
 22. Heidari M, Khorramdel K, Rakhshani T, Kazem S. Comparison of humanistic factor in incidence of driving accidents between Business community. *Quarterly Scientific Journal of Rescue & Relief*. 2012;4:39-45. Persian.
 23. Mehmandar M, Soori H, Amiri M, Norouzrad R, Khabzkhooob M. Risk factors for fatal and nonfatal road crashes in Iran. *Iran Red Crescent Med J*. 2014;16:e10016. doi: 10.5812/ircmj.10016. PubMed PMID: 25389468; PubMed Central PMCID: PMC4221994.
 24. Vaux LM, Ni R, Rizzo M, Uc EY, Andersen GJ. Detection of imminent collisions by drivers with Alzheimer's disease and Parkinson's disease: a preliminary study. *Accid Anal Prev*. 2010;42:852-8. doi: 10.1016/j.aap.2009.07.009. PubMed PMID: 20380912; PubMed Central PMCID: PMC3102017.
 25. Dobson A, Brown W, Ball J, Powers J, McFadden M. Women drivers' behaviour, socio-demographic characteristics and accidents. *Accid Anal Prev*. 1999;31:525-35. PubMed PMID: 10440550.
 26. Kheirabadi GR, Bolhari J. Role of human factors in road accidents. *Journal of Research in Behavioural Sciences*. 2012;10:69-78. Persian.
 27. Elander J, West R, French D. Behavioral correlates of individual differences in road-traffic crash risk: an examination method and findings. *Psychol Bull*. 1993;113:279-94. PubMed PMID: 8451335.
 28. Gosselin D, Gagnon S, Stinchcombe A, Joannisse M. Comparative optimism among drivers: an intergenerational portrait. *Accid Anal Prev*. 2010;42:734-40. doi: 10.1016/j.aap.2009.11.001. PubMed PMID: 20159101.
 29. Entezami N, Hashemi-Nazari SS, Soori H, Khosravi A, Ghadirzadeh MR. Epidemiology of fatal road traffic accidents in Northern provinces of Iran during 2009 to 2010. *Safety Promotion and Injury Prevention*. 2015;3:1-8.
 30. Gardner JW, Sanborn JS. Years of potential life lost (YPLL)--what does it measure? *Epidemiology*. 1990;1:322-9. PubMed PMID: 2083312.
 31. Mohammadi M, Alavi S, Jannatifard F, Mohammadi Kalthory S, Babareisi M, Khodakarami R, editors. *Bipolar disorders in truck drivers with driving licence category D&C*. Tehran: 5th congress of Iranian Psychological association (Contemporary Psychology, Biannual Journal of the Iranian Psychological Association). 2015. p. 1411-4.
 32. da Silva-Junior FP, de Pinho RS, de Mello MT, de Bruin VM, de Bruin PF. Risk factors for depression in truck drivers. *Soc Psychiatry Psychiatr Epidemiol*. 2009;44:125-9. doi: 10.1007/s00127-008-0412-3. PubMed PMID: 18642121.
 33. Shinar D, Schechtman E, Compton R. Self-reports of safe driving behaviors in relationship to sex, age, education and income in the US adult driving population. *Accid Anal Prev*. 2001;33:111-6. PubMed PMID: 11189114.
 34. Zolghi A, Maleki H. Taking incident (Review of research on the role of human factors in accidents, to develop a model to explanation). *Journal of Danesh-e-Entezami*. 2006;8:100-21. Persian.
 35. Asghari F, Mohammadi N, Rezazadeh Mehrjoo M. The survey relationship between anxiety and aggression with driving psychology. *Rahvar*. 2015;12:49-61. Persian.
 36. Lajunen T. Personality and accident liability: are extraversion, neuroticism and psychoticism related to traffic and occupational fatalities? *Personality and Individual Differences*. 2001;31:1365-73.
 37. Fyhri A, Backer-Grondahl A. Personality and risk perception in transport. *Accid Anal Prev*. 2012;49:470-5. doi: 10.1016/j.aap.2012.03.017. PubMed PMID: 23036425.
 38. Dahlen ER, White RP. The Big Five factors, sensation seeking, and driving anger in the prediction of unsafe driving. *Pers Individ Dif*. 2006;41:903-15.
 39. Bone SA, Mowen JC. Identifying the traits of aggressive and distracted drivers: A hierarchical trait model approach. *Journal of Consumer Behaviour*. 2006;5:454-64.
 40. Jafarpour S, Rahimi-Movaghar V. Determinants of risky driving behavior: a narrative review. *Med J Islam Repub Iran*. 2014;28:142. PubMed PMID: 25695000; PubMed Central PMCID: PMC4322337.