Dangerous Driving Behaviors among Professional Drivers of Kashan

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Abstract

Aims: Underlying psychological causes of road accidents needs to be more identified in Iran. According to studies, human errors are the most effective factor of driving accidents. The purpose of this study was to identify dangerous driving behaviors among professional drivers in Kashan. **Materials and Methods:** Data for this descriptive cross-sectional study were collected in Occupational Medicine Center of Kashan, Truckers Cooperative, and Aran and Bidgol Kavir Steel Company during autumn 2017 and winter 2018. Demographic information and Driving Behavior Questionnaire were completed. Data were analyzed using Chi-square and one-way ANOVA tests by SPSS version 16. **Results:** Studied drivers included 61 (20.1%) bus, 95 (31.4%) truck, and 147 (48.5%) trailer drivers aged 43.15 ± 10.29 with 19.48 ± 11.34 years of driving experience. Fifty-nine drivers (19.5%) had at least one accident; of them, 10 (17%) resulted in death. Seventy-two drivers (23.7%) received up to 20 penalties. There was a significant relationship between type of vehicle and age, work experience, number of working days per week, average driving speed, and smoking. There was a statistically significant relationship between slip and accident ($P = 0.007$). Penalties in bus drivers were significantly related to mistake ($P = 0.026$) and slips ($P = 0.027$). There was a statistically significant relationship between penalty and risky violations ($P = 0.002$), slips ($P = 0.002$), highway violations ($P = 0.003$), mistake ($P = 0.029$), and general behavior ($P = 0.001$) in trailer drivers. **Conclusion:** Assessing driving behavior and screening procedures when selecting professional drivers can reduce the incidence of accidents.

Keywords: Dangerous behavior, driving behavior, traffic accidents, traffic safety policy

INTRODUCTION

Driving accidents are one of the major health problems that endanger human health.[1] Official statistics related to Iran indicate that traffic accidents are the second leading cause of death after cardiovascular diseases and unfortunately the first cause in the age group under 40.[2] Buses and freight vehicles are classified as heavy road activities. Overall, about 7.8 percent of all vehicles make up the two groups. In 2005, heavy vehicle accidents ranked second (32%) in fatal accidents.[3] According to the Federal Motor Carrier Safety Administration in 2014, there were 4,161 deaths and 132,000 injuries in major truck and bus accidents in the United States.[4] Europe also recorded 1357 deaths from bus and freight forwarding accidents in 2013. Large truck accidents involving deaths cost an average of $ 3.6 million per accident. The cost of injuries resulting from these accidents is about $ 200,000 per person.[5] As a social phenomenon in Iran, road accidents need to be more

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identified in terms of underlying cultural, psychological, and sociological aspects as well as technology-induced barriers such as the quality of roads and streets, cars, and so on. Disability and injury rates due to traffic and road accidents are 10–15 times more than its mortality rate.[6] Researchers in many countries, including the United States, investigated the triple factors regarding traffic accidents, including vehicle, road or environment, and human. According to these studies, human errors are the most effective factor of driving accidents.[7] Driving is a behavior that a driver chooses, as actionable patterns to perform by vehicle, such as driving speed, keep standard distance, and so on.[8] Due to the fact that dangerous driving behaviors are one of the most important and effective factors in the occurrence of traffic accidents, investigating these behaviors is necessary for traffic safety policy-making and planning.[9] Most of the risky behaviors lead to an accident, however, these behaviors are not the same. Dangerous driving behaviors include three categories: inadvertent errors, slips, and violations.[10-12] Studies have also found a significant relationship between unsafe driving behaviors and accident risk. Mortazavi *et al*. in a study in 2014 investigated the relationship between dangerous driving behaviors and accident risk on 628 bus drivers in Tehran. The results showed that there was a significant positive relationship between traffic accidents during three previous years and highway violations.[13] Sullman study in 2002 aiming investigation of dangerous driving behaviors among 382 New Zealand truck drivers revealed that among the most dangerous driving behaviors, driving violations were predictive of accident risk.[14] Dangerous driving behaviors are important since they can threaten the health and life of people including the drivers themselves. It is obvious that by identifying the types of behaviors, determining the share of each and their related factors, we can reduce the rate car accidents by cooperating with the responsible organizations in adopting the necessary policies and measures in order to modify unsafe driving behaviors.[15] The purpose of this study was to identify dangerous driving behaviors among professional drivers in Kashan.

Materials and Methods

The present study was a descriptive cross-sectional study. According to a similar study, Pearson's correlation coefficient between high-speed driving and sensation seeking was calculated to be 0.26.[16] Considering 0.95 reliability and 0.95 test power, the minimum required sample was calculated 186, however, the sample size was increased up to 300 professional drivers. Drivers whose main job were driving and made living by driving were considered as professional driver and included in the study. Heavy vehicles were defined as vehicles weighing more than 3.5 tones.[17] Data were collected during autumn 2017 and winter 2018.

The questionnaires were completed in Kashan Occupational Medicine Center, Kashan Truckers Cooperative, and Aran and Bidgol Kavir Steel Company. To collect information, the participants were given the necessary explanations for the purpose of the study and assured about the confidentiality of their information. Two questionnaires were completed for each driver. The first questionnaire included demographic information, type of vehicle, history of illness, drug and smoking, and work schedule (shift work defined as hours beyond 7 am to 6 pm).[17] Driving speed, year of work experience, driving time per day and number of driving days per week, and number of accidents over the past 3 years were also recorded. The second questionnaire was the Persian version of the Driving Behavior Questionnaire (DBQ). This questionnaire, validated by Mortazavi *et al*., includes only 15 items of the 50-item version of the original DBQ provided by Rissen *et al*. The questions are in a 1–5 Likert scale (never = 1, rarely = 2, occasionally = 3, most often = 4, and always = 5). To get scores for each dimension, we sum up the scores of the questions of that dimension. The questionnaire has four dimensions:

a. Slip, a mistake caused by problems in attention, memory, and information processing, consists of 4 questions, then ranging from 4 to 20 scores
b. Error is a mistake caused by the driver's inability to perform an optional action correctly. This dimension includes 3 questions and ranges from 3 to 15 scores
c. Highway violations are focused on gaining advantage and include behaviors such as speeding and overtaking red lights. It includes 3 questions and is in the range of 3–15 scores
d. Risky violations are abusive behaviors that are always intentional, high risk, nonemotional and that drivers accept such risks for convenience or benefit. It includes 5 questions, and then, its score ranges between 5 and 25.

It is worth noting that the sum of the four-dimensional scores in this questionnaire gives a total score that represents the driving behavior of the drivers in the range of 15–75. The higher the overall driving behavior score indicates that the driver has committed high errors, mistakes, and violations. In Mortazavi *et al*. study, the validity and reliability of the dangerous behavior questionnaire showed that the Cronbach's alpha coefficient was 0.83 for all the drivers' dangerous behavior questionnaire, which shows a good internal consistency for the questions.[18] After data collection, the data were analyzed by SPSS software version 16. Normality of data was evaluated using Kolmogorov–Smirnov test, and then, Chi-square test, independent samples *t*-test, and one-way ANOVA test were used for statistical analyses.

Results

Out of 303 drivers, the number (percentage) of bus, truck, and trailer drivers was 61 (20.1%), 95 (31.4%), and 147 (48.5%), respectively. Their age ranged 21–75, with a mean of 43.15 (standard deviation [SD] = 10.29). Driving experience of the participants varied from 1 to 54 years, with a mean of 19.48 years (SD = 11.34). Eighteen drivers (5.9%) were single, and the others (94.1%) were married. Thirty-three

drivers (10.9%) had academic education. Table 1 shows the demographic and occupational characteristics of the drivers. Out of participants, 59 drivers (19.5%) had experienced at least one episode of accident. From those accidents, 10 episodes (17%) resulted in a death, and 25 episodes (42.4%) caused injuries such as fractures, burns, and organ failure. Fractures accounted for most of the injuries (20.3%). Twenty-three (38%) of the traffic accidents caused no injuries. The results showed that 231 drivers (76.3%) had received at least one penalty. More information about accidents and penalties in studied drivers are presented in Table 2. Statistical tests showed a significant association between type of vehicle and age, work experience, driving time per week by day, average driving speed, and smoking [Table 1]. Other results also showed no statistically significant relationship between type of vehicle and penalty, history of accident, and its severity [Table 2]. The calculated mean scores of four dimensions of DBQ scale were used for statistical analysis [Table 3]. The results showed that there was a statistically significant relationship between slip and accident. Furthermore, penalties in bus drivers were significantly related to mistake and slips. There was a statistically significant relationship between penalty and risky violations, slips, highway violations, mistake, and general behavior in trailer drivers [Table 3].

Table 1: Demographic characteristics of professional drivers

Type of vehicle	Bus	Truck	Trailer	Total	*P*
Marital status, *n* (%)					
Single	8 (11.5)	3 (3.2)	8 (5.4)	18 (5.9)	0.094[a]
Marred	54 (88.5)	92 (96.8)	139 (94.6)	285 (94.1)	
Education status, *n* (%)					
9	36 (59)	64 (67.3)	86 (58.5)	186 (61.4)	0.67[a]
12	17 (27.9)	23 (24.2)	44 (29.9)	84 (27.8)	
University education	8 (13)	8 (8.4)	17 (11.5)	33 (11)	
History of chronic disease, *n* (%)	50 (82)	80 (84.2)	129 (87.8)	259 (85.5)	0.511[a]
Driving at night	9 (14.8)	18 (18.9)	18 (12.2)	45 (14.9)	0.359[a]
Age (mean±SD)	10.15±41.28	11.32±45.59	9.38±42.35	10.29±43.15	0.016[b]
Professional driving experience (mean±SD)	17.93±11.10	12.28±22.19	10.55±18.37	19.48±11.34	0.018[b]
Hours of driving in a day (mean±SD)	4.07±10.79	4.68±11.88	3.86±12.20	4.2±11.82	0.086[b]
Days of driving in a week (mean±SD)	1.5±5.75	1.76±4.84	1.59±5.17	1.65±5.18	0.003[b]
Average speed (mean±SD)	75.16±95	11.42±82.95	10.89±84.12	85.94±13.22	>0.001[b]
Smoking habit, *n* (%)	32 (52.5)	35 (36.8)	44 (29.9)	111 (36.6)	0.009[a]
Alcohol consumption, *n* (%)	7 (11.5)	7 (7.4)	6 (4.1)	20 (6.6)	0.138[a]
Drug consumption, *n* (%)	2 (3.3)	3 (3.2)	4 (2.7)	131 (43.2)	0.969[a]

[a]Chi-square tests, [b]ANOVA. SD: Standard deviation

Table 2: Penalty and accident information of the drivers

Type of vehicle	Bus	Truck	Trailer	Total	*P*
Accidents involved in previous 3 years, *n* (%)					
No	50 (82)	76 (80)	118 (80.3)	244 (80.5)	0.95[a]
Yes	11 (18)	19 (20)	28 (19)	59 (19.5)	
Severity of accident					
Death	4 (36.3)	1 (5.2)	5 (17.2)	10 (17)	0.617[a]
Maim	0 (0)	0 (0)	1 (3.4)	1 (1.7)	
Fracture	2 (18.2)	4 (21.1)	6 (20.7)	12 (20.3)	
Burn	0 (0)	1 (5.2)	1 (3.4)	2 (3.4)	
Injury	0 (0)	3 (15.7)	3 (10.4)	6 (10.1)	
Other	2 (18.2)	2 (10.5)	1 (3.4)	5 (8.5)	
No	3 (27.7)	8 (42.1)	12 (41.4)	23 (39)	
Number of received penalty in previous 3 years, *n* (%)					
0	20 (32.8)	17 (17.9)	35 (23.8)	72 (23.8)	0.130[a]
1-5	27 (44.26)	60 (63.15)	71 (48.3)	158 (52.1)	
6-10	9 (14)	15 (24.6)	31 (21.08)	55 (15.5)	
11-15	2 (3.8)	1 (1)	1 (0.6)	4. (1.3)	
16-20	3 (4.9)	2 (2.1)	9 (6.1)	14 (4.6)	
Accident (mean±SD)	0.388±0.18	0.402±0.20	0.457±0.21	0.426±0.20	0.895[b]
Penalty (mean±SD)	4±5.94	3.82±3.88	5.06±7.86	4.46±6.48	0.288[b]

[a]Chi-square tests, [b]ANOVA. SD: Standard deviation

Table 3: Mean and standard deviation of driver dangerous behavior

Type of vehicle	Variable	Mean±SD				
		Risky violation	Slip	Highway violation	Mistake	Total score
Bus	Accident					
	Yes	7.75±2.26	6.25±2	3.58±0.66	4.33±1.43	21.92±3.05
	No	8.92±4	4.88±1.39	4.29±1.55	4±1.24	22.08±5.15
	P^a	0.336	0.007	0.133	0.422	0.916
	Penalty					
	Yes	8.41±3.61	5.46±1.79	4.29±1.61	4.32±1.38	22.49±4.54
	No	9.25±4.02	0.889±4.5	0.988±3.85	0.826±3.55	5.27±21.15
	P^a	0.437	0.027	0.266	0.026	0.338
	Severity of accident					
	Death	7.75±2.87	6.25±1.7	3.75±0.957	3.75±0.5	21.50±2.08
	Injury	7.8±2.77	5.6±2.51	3.4±0.54	5.2±1.78	22±4.69
	No	7.67±0.577	7.33±1.52	3.67±0.577	3.67±1.155	22.33±0.577
	P^b	0.997	0.542	0.753	0.222	0.946
Truck	Accident					
	Yes	7.25±2.78	6.35±2.05	3.95±1.14	4.6±1.53	22.15±5.17
	No	6.89±2.18	5.79±1.84	4.4±1.39	4.36±1.6	21.44±5.13
	P^a	0.543	0.24	0.188	0.551	0.585
	Penalty					
	Yes	7.04±2.27	5.97±1.98	4.31±1.37	4.5±1.61	21.82±5.21
	No	6.65±2.54	5.59±1.46	4.29±1.31	4±1.45	20.53±4.67
	P^a	0.53	0.45	0.97	0.241	0.35
	Severity of accident					
	Death	5	5	4	3	17
	Injury	6.78±1.922	5.33±1.65	3.56±0.726	4.56±1.81	20.22±4.32
	No	7.5±2.92	7.5±2.2	3.88±1.24	4.75±1.38	23.63±5.12
	P^b	0.594	0.086	0.778	0.608	0.235
Trailer	Accident					
	Yes	7.74±2.82	6.42±2.27	4.45±1.89	5.32±2.02	23.94±7.28
	No	7.73±2.48	6.25±2.07	4.47±1.85	5.11±1.77	23.56±5.98
	P^a	0.986	0.693	0.971	0.571	0.768
	Penalty					
	Yes	8.04±2.65	6.53±2.24	4.65±2.01	5.34±1.88	24.56±6.58
	No	6.74±1.9	5.51±1.38	3.86±1.06	4.57±1.52	20.69±3.84
	P^a	0.002	0.002	0.003	0.029	0.001
	Severity of accident					
	Death	8.86±3.23	7.71±3.4	5.43±2.63	5.57±1.98	27.57±9.82
	Injury	8.33±3.08	6.44±1.66	4.89±2.14	5.44±2.65	25.11±6.39
	No	7.08±2.57	6.08±1.88	3.92±0.996	5±1.41	22.08±6.4
	P^b	0.401	0.33	0.23	0.806	0.295

[a]Independent samples *t*-tests, [b]ANOVA. SD: Standard deviation

DISCUSSION

One of the most popular measurement tools for driving behaviors is the Manchester DBQ.[19] In this study, driving behaviors in professional drivers were assessed using the DBQ; then, the relationship between driver behavior and the number and severity of accident in the past 3 years was investigated. According to the results, there was no statistically significant relationship between dangerous driving behavior and accident and its severity. There was only a significant relationship between slip and accident among bus drivers. This finding is inconsistent with the results of a study conducted by Mallia *et al*. in 2015 on bus drivers in Italy. The results of the Mallia study showed a statistically positive relationship between high-risk driving behaviors (violations) and accident.[20] While consistent with the results of the study by Lucidi *et al*. in 2014, more errors have a stronger statistical relationship with more accidents.[21] It also contrasts with the study of Wang *et al*., 2014, on Chinese professional drivers. According to Wang's results, taxi drivers have more risky behavior and therefore more likely to be involved in a car accident.[22] The reason for this inconsistency can be attributed to the type of vehicle in the first place. The size and characteristics of heavy vehicles make it less likely for drivers to show dangerous behaviors.

Second, drivers of heavy vehicles are more skilled at facing dangerous driving situations. Furthermore, they have also received more training than other drivers to obtain a certificate. Third, heavy vehicles are more visible on the road than light cars, so the behavior of their drivers is more taken into consideration. Accidents of heavy vehicles, especially buses, are more reflected in mass media. There is also a call number provided by the bus shipping companies to poll people on how the bus drivers act. Fourth, losing the driving license is more disabling for a driver of heavy vehicle in comparison to an ordinary person. Various studies show the effect of dangerous behaviors on the frequency of accidents. On the other hand, the occurrence of previous accidents affects the dangerous behaviors of people.[23] Therefore, in this study, the accident history of drivers was investigated. The results showed that 59 out of 303 drivers (19.5%) reported at least one accident in the past 3 years. This percentage is higher than the percentage of traffic accidents of heavy vehicle drivers (7.7%) reported in the study by Seyyedmehdi *et al*. 2010.[17] A study by Mohammadi *et al.*, 2015, on truck and bus drivers showed that 32% of all drivers had a single accident or more.[24] A study by Živković *et al*. in 2015 showed that 24% of drivers were involved in an accident over a 5-year period.[25] Both recent studies show that a higher percentage of drivers were involved in a crash than the current study. In spite of the lack of a statistically significant relationship between dangerous driving behaviors and the risk of accident, only in truck drivers, there is a statistically significant relationship between dangerous driving behaviors and penalties. In Mohammadfam *et al*. investigation on unsafe behaviors among bus drivers in 2004, the most unsafe behaviors observed were driver talking, overspeeding, and insufficient distance to front vehicles,[26] whereas in the present study, according to the drivers' statements in the questionnaire, most of the violations resulted in penalties for bus drivers were attempting to take passengers at unauthorized stations and overcapacity passengers, high speed, and disregard distance to the front vehicles. Of course, the most common reasons resulted in penalties for truck drivers were driving in unauthorized pathways and lack of a technical examination sheet. Varmazyar *et al*., in their 2013 study, found that there was no statistically significant relationship between traffic penalty and dangerous driving behaviors, whereas there was a statistically significant relationship between traffic penalty and accident risk. This means that drivers with more traffic penalties may be more prone to accident. They suggest that the number of driving penalty can be reduced by improving safety culture. They recommend further research to examine the safety culture of professional drivers and consider the effectiveness of promoting safety culture – as a tool to reduce traffic penalty and thus reduce accidents.[27] In the current study, 60% of drivers were under 45 years old. Furthermore, the majority of them did not have a college education. This is consistent with the demographic characteristics of the drivers surveyed in Tavakoli Kashani *et al*. 2018 and Živković *et al*. 2013.[25,28] In a study by Tseng 2012, more than half of drivers (63.6%) were under the age of 49, and only 5.6%

of drivers had a college degree. In the present study, the driving experience of drivers was between 1 and 54 years. Almost one-fifth (21.6%) of drivers had <5 years of driving experience, of which 4.8% were novice drivers (<3 years).[29] The difference between groups of drivers and their age was statistically significant. Bener *et al*. 2017 also observed a significant relationship between age and different groups of drivers.[30] In the present study, there was a statistically significant relationship between driving time per week among different groups of drivers, as bus drivers have higher average days of driving than other drivers. The results of statistical tests also showed that the average speed of driving varies between different groups of drivers, so that bus drivers are faster than other groups. Similar results were also observed in the study by Bener *et al*. 2017.[30] In a study by Hammam *et al*. in 2018 on Egyptian bus drivers, 80% of drivers were overspeeding.[31] This result may also indicate that speeding presents serious risks to road safety. The consequences of a car accident are very critical in this job, because in addition to threatening the life and health of the driver, they may endanger the lives of dozens more. These results indicate that targeted strategies are needed to reduce traffic accidents among bus drivers to reduce speeds and offenses. There were some methodological limitations in this study. First, the DBQ data may be inaccurate because of the self-report. However, a meta-analysis by de Winter and Dodou 2010 showed that the DBQ significantly predicts the accident, and can be a useful benchmark for driving safety studies.[32] Second, reports of accident information may not be reliable. Finally, many accidents and injuries may not be reported. As a result, their association with high-risk behaviors may be significantly underestimated. To reduce these biases, drivers were assured that their information would remain confidential and anonymous.

Conclusion

This study offers practical indications for traffic safety regulations which could be readily implemented to enhance traffic safety. The results may contribute to the development of interventions for drivers' education and accident prevention. Assessing driving behavior and screening procedures when selecting professional drivers can reduce the incidence of accidents. Using DBQ is recommended in drivers' recruitment and screening programs.

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Conflicts of interest
There are no conflicts of interest.

References

1. Monsef Kasmayi V, Assadi P, Maleki Ziabari SM. The epidemiologic of the traffic accidents helped by EMS, Guilan 2011-2013. IJFM 2014;20:55-60.
2. Shahla A, Charesaz S. Injuries resulting from motorcycle-induced trauma during two years period in Shahid Motahari clinical center of URMIA. Sci J Forens Med 2006;12:73-79.

3. Ahmadi Dizaj I, Haji Hoseyni M, Mikaeili N. The role of the heavy freight vehicle in Urban accidents. Rahvar 2014;1393:73-95.

4. Federal Motor Carrier Safety Administration; (April 11, 2016). Available from: https://www.fmcsa.dot.gov/safety/data-and-statistics/large-truck-and-bus-crash-facts-2014. [Last accessed on 2020 Aug 10].

5. Vetter M, Schünemann AL, Brieber D, Debelak R, Gatscha M, Grünsteidel F, *et al*. Cognitive and personality determinants of safe driving performance in professional drivers. Transp Res Part F Traffic Psychol Behav 2018;52:191-201.

6. Erfanpoor S, Hashemi Nazari SS, Ghadirzadeh MR. An epidemiology study of fatal road traffic accidents in Khorasan Razavi province in 2011. Med J Mashhad Univ Med Sci 2016;59:261-68.

7. Elvik R. The effect on accidents of technical inspections of heavy vehicles in Norway. Accid Anal Prev 2002;34:753-62.

8. McCall BP, Horwitz IB. Occupational vehicular accident claims: A workers' compensation analysis of Oregon truck drivers 1990-1997. Accid Anal Prev 2005;37:767-74.

9. Tahmasby F, Zamani-Alavijeh F, Rostam-Niakan S, Asadollahi A. Investigation of influencing factors of taxi drivers' risky behavior in Ahvaz in 2013. Sci J Ilam Univ Med Sci 2014;2:143-51.

10. Alavi SS, Mohammadi MR, Soori H, Jannatifard F, Mohammadi-Alhory S. The determination of cognitivebehavioral features of bus and truck drivers during road accidents. J Saf Promot Inj Prev 2016;3:223-32.

11. Oreyzi HR, Haghayegh SA. Psychometric properties of the manchester driving behavior questionnaire. Payesh 2010;1:21-8.

12. Reason J, Manstead A, Stradling S, Baxter J, Campbell K. Errors and violations on the roads: A real distinction? Ergonomics 1990;33:1315-32.

13. Varmazyar S, Mortazavi SB, Arghami S, Hajizadeh E. Factor analysis of driver behavior questionnaire (DBQ) in public transportation Bus Company: Investigation of the relationship between DBQ factors and crashes. Sci J Rev 2014;3:155-65.

14. Sullman MJ, Meadows ML, Pajo KB. Aberrant driving behaviors amongst New Zealand truck drivers. Transp Res Part F Traffic Psychol Behav 2002;5:217-32.

15. Rahimi A, Kazemi M. Drivers risky culture analysis in urban and rural area. Rahvar 2012;1390:49-66.

16. Arnett J, Offer D, Fine MA. Reckless driving in adolescence: state and trait factors. Accident Analysis Prevention 1997;29:57-63.

17. Seyyedmehdi SM, Dehghan F, Salari S, Hedayati MM, Attarchi M. Assessment of frequency of accidents and related factors in professional drivers of heavy vehicles. Sci J Forensic Med 2010;16:187-94.

18. Varmazyar S, Mortazavi SB, Arghami SH, Hajizadeh E. Determination of the validity and reliability of bus drivers' behaviour questionnaire in Tehran in 2012: Exploratory and confirmatory factor analysis.

J Rafsanjan Univ Med Sci 2014;13:235-48.

19. Lajunen T, Parker D, Summala H. The Manchester Driver Behaviour Questionnaire: A cross-cultural study. Accid Anal Prev 2004;36:231-8.

20. Mallia L, Lazuras L, Violani C, Lucidi F. Crash risk and aberrant driving behaviors among bus drivers: The role of personality and attitudes towards traffic safety. Accident Analysis Prevention 2015;79:145-51.

21. Lucidi F, Mallia L, Lazuras L, Violani C. Personality and attitudes as predictors of risky driving among older drivers. Accident Analysis Prevention 2014;72:318-24. doi:10.1016/j.aap.2014.07.022.

22. Wang Y, Li L, Feng L, Peng H. Professional drivers' views on risky driving behaviors and accident liability: A questionnaire survey in Xining, China. Trans lett 2014;6:126-35.

23. Tyler W. Measuring unsafe behavior. Profess Safety 1966;19:20-4.

24. Alavi SS, Mohammadi MR, Soori H, Jannatifard F, Mohammadi-Kalhory S. The determination of Cognitive-behavioral features of bus and Truck drivers during road accidents in 2013-2014. Safety Promot Injury Prevent 2016;3:223-32.

25. Živković S, Nikolić V, Markič M. Influence of professional drivers' personality traits on road traffic safety: Case study. Int J Inj Contr Saf Promot 2015;22:100-10.

26. Mohammadfam I, Golmohammadi R. Evaluation of safety behavior among coach drivers in Hamadan. Zahedan J Res Med Sci 2004;5:251-60.

27. Varmazyar S, Mortazavi SB, Hajizadeh E, Arghami S. The relationship between driving aberrant behavior and self-reported accidents involvement amongst professional bus drivers in the public transportation company. Health Scope 2013;2:110-5.

28. Tavakoli Kashani A, Besharati MM, Radmard A. Exploring the relationship between work shift and demographic variables with driving Behaviour among intercity bus drivers. Health Safety Work 2018;8:309-21.

29. Tseng CM. Social-demographics, driving experience and yearly driving distance in relation to a tour bus driver's at-fault accident risk. Tourism Manag 2012;33:910-15.

30. Bener A, Lajunen T, Özkan T, Yildirim E, Jadaan KS. The impact of aggressive behaviour, sleeping, and fatigue on road traffic crashes as comparison between minibus/van/pick-up and commercial taxi drivers. J Traffic Transp Eng 2017;5:21-31.

31. Hammam RA, Zalat MM, Abdelsalam NM, Mesallam DI. Substance abuse and driving behavior among professional minibus drivers at Zagazig City, Sharqia Governorate, Egypt. Egyp J Occupat Med 2018;42:365-82.

32. de Winter JC, Dodou D. The driver behaviour questionnaire as a predictor of accidents: A meta-analysis. J Saf Res 2010;41:463-70.