

# Driver's Age and Rear-End Crashes Associated with Distraction

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## Abstract

**Background and Objectives:** Distraction is one of the affective factors in the occurrence of traffic accidents, which, in its turn, is the second leading cause of death and the main cause of years of life lost due to premature death and disability in Iran. The aim of the present study was to investigate the distracting behaviors of male drivers in rear-end crashes. **Materials and Methods:** This descriptive cross-sectional study was conducted on male drivers who had experienced a rear-end crash in Tabriz in 2018. In total, 395 samples (whose main reason for the crashes was inattention to the forward field of view) were selected through the information and files available at the traffic police, and after contacting the subjects, the required information was entered in the checklist. Nine distraction factors were classified and ranked into three age groups of young, middle-aged, and older drivers. **Results:** Findings showed that distractions caused by mobile phone use and passengers were ranked first to third in all three age groups and distracting factors such as eating or drinking while driving, alcohol consumption, and sleepiness were in the last ranks. In addition, older drivers were ranked first in not identifying the distraction factors, and in the middle-aged group, the distraction caused by billboards was the leading cause of crashes. **Conclusions:** Adopting appropriate policies, such as law enforcement and cultural interventions to prevent driver distractions, and to control the in-car conversation, and cell phone use while driving can be considered as effective interventions to prevent rear-end crashes.

**Keywords:** Age, behavior, driver distraction, traffic accident

## INTRODUCTION

Road traffic injuries are of the major global public health problems, requiring concerted efforts for effective and sustainable prevention. Of all the systems that people have to deal with daily, road transport is the most complex and the most dangerous.<sup>[1-3]</sup> According to the World Health Organization's recently released Global Status Report on Road Safety 2018, road deaths continue to rise worldwide and more than 1.35 million people die every year as a result of road traffic accidents. Over 90% of the world's road traffic fatalities occur in low- and middle-income countries. According to the World Health Organization, if the current trend continues and preventive activities are not carried out, annual road traffic deaths are predicted to become the third leading cause of death by 2030.<sup>[3,4]</sup> Road traffic fatalities in the world have been three per 10,000 vehicles, while in Iran, it has been 33 cases per 10,000 vehicles. Unfortunately, in recent decades, it has dramatically increased in a way that, according to the World

Health Organization, Iran, in terms of traffic accidents, is one of the countries with the highest death rates.<sup>[5]</sup> According to the National Highway Traffic Safety Administration, rear-end collisions are the crashes that occur the most frequently. Such collisions are responsible for about 29% of all traffic accidents nationwide.<sup>[6]</sup> Various factors affect the occurrence of road traffic accidents that in 90%–95% of most accidents, driver behavior is known as the main cause of traffic accidents.<sup>[7]</sup> Factors involved in road traffic accidents include personal characteristics such as gender, age, and driver behaviors. Some behaviors are known as distraction behaviors, such as

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conversation on a mobile phone or talking to the occupants while driving, controlling car options, eating and drinking, sleepiness, and smoking, all of which can increase the risk of road traffic accidents.<sup>[8-23]</sup> Driver distraction is the diversion of attention away from activities critical for safe driving toward a competing activity. When drivers are distracted, their attention is temporarily divided between what is often referred to as the “primary task” of driving and “secondary tasks” not related to driving which can lead to a crash.<sup>[24]</sup> Driving distraction is one of the human factors related to road traffic accidents, which is considered as a road safety issue worldwide, and it is an important part of motor vehicle accidents in a way that in some studies, 23%–71% of accidents are distraction related.<sup>[24-27]</sup> Smoking while driving causes road traffic accidents due to visual and cognitive distraction, which can result in more severe injuries if the driver is not wearing a seat belt at the time of the crash.<sup>[28]</sup> Epidemiological studies have shown that drivers who use a mobile phone while driving are more likely to have a crash than drivers who do not use it.<sup>[11,29]</sup> Mobile phone use is one of the most important factors that distract drivers and increase the risk of accidents with motor vehicles in a way that it causes distraction even more than the time that the driver talks to other occupants.<sup>[9,10]</sup> In developed countries, the rate of mobile phone usage is high and still rising.<sup>[30]</sup> According to the reports of International Traffic Safety, 25% of drivers use their mobile phones and 3% send text messages while driving, among which the number of women who used their mobile phones while driving was more than men.<sup>[31]</sup> Using a cellphone, while driving, increases crash risk up to 30%.<sup>[12]</sup> Driving is a complex task that requires drivers to possess the skill of processing various sensory areas such as visual, auditory, biomechanical, and cognitive.<sup>[32]</sup> Therefore, it is necessary to examine the behavior of drivers so that they can be studied in future intervention programs.<sup>[28]</sup> Because the frequency and severity of rear-end crashes are very high in the city (as compared to other traffic accidents) and in most cases, distracting factors are the main cause of these traffic accidents. The aim of the present study was to investigate the distracting factors of male drivers with different age groups in rear-end crashes. Therefore, several distracting factors were introduced to adopt the necessary policies, which play a significant role in the prevention of these types of crashes.

## METHODS

This descriptive cross-sectional study was conducted in Tabriz. The statistical population included all drivers who had experienced rear-end crashes in 2018. The information and files available at the traffic police were used to reach the drivers. The information related to the files of all fatal and traumatic traffic accidents in Tabriz was classified and presented in the form of a general crash report, which was completed by the officers present at the scene of the crash. These files contained very useful information such as the contact number of the driver who was found guilty, the exact time and place of the incident, how it was dealt with, and so on. At the first stage of the study,

outlines related to the purpose of the study (rear-end crashes) were extracted, which included 700 crashes in 2018. With 95% confidence, the standard deviation is 0.5 and the margin of error is 5% ±. The sample size was 430. In this research, 395 samples had been considered. In addition, the sampling method was simple random. In other words, each member of the community had an equal chance to be selected in the sample. Inclusion criteria of the study consisted of rear-end crashes, survival of the driver, being a resident of Tabriz, having a driver’s license, and being a male driver. The reason for not selecting female drivers in this study was their very small number of crashes (<10% of male driver crashes). The low percentage of female drivers in crashes was due to the small number of female drivers compared to men in Iran. A researcher-made questionnaire was used to obtain the required information. After preparation of the form, the driver was contacted and informed about the purpose of the study, and after agreeing to participate in the study, the data collection form was completed through a 5–10-min interview. This form includes “first name” and “last name” (to ensure a nonfatal crash), crash type (to ensure rear-end crash), driver age, driver gender, crash reason (some drivers could not recognize the reason for the crash), and driving license. Telephone contacts for all drivers were conducted by one interviewer. The two main variables for this study were age and rear-end crash reason. Descriptive statistics were calculated for the age (mean, standard deviation, minimum, and maximum), and then due to the crash reason, the significance of the age was examined. Finally, the reason for the crashes was prioritized for each age group. All analyzes were performed with SPSS version 22 South Wacker Drive, Chicago, Illinois, U.S.A.

## RESULTS

Four hundred and thirty cases were selected randomly, out of which 22 died after the crash, 13 withdrew from the study, and 395 were eventually enrolled. Subjects were divided into three age groups: young, middle-aged, and older adults. More than half of the subjects were young adults, and the older adults had the lowest number of participants. Table 1 shows a statistical summary of all three age groups. The reasons for drivers’ distraction in rear-end crashes were divided into nine categories and presented based on age groups.

Table 2 shows a statistical analysis of distraction factors in different age groups. To analyze the causes for distraction in different age groups, the ranking method was used so that the

**Table 1: Statistical summary of drivers with different age groups**

Age category	Obs <sup>a</sup>	Mean ± SD	Minimum	Maximum
Young	203	25.23153 ± 4.207	18	34
Middle-aged	145	44.34483 ± 4.902	37	55
Elderly	47	60.14894 ± 3.682	56	67

<sup>a</sup>Observation (number of people in each age category). SD: Standard deviation

causes for distraction in different age groups were ranked from 1 to 9. Furthermore, in Table 2, the Chi-square test showed that the reason for rear-end crashes differed significantly in age groups.

Table 3 shows the rankings of the causes of distraction in different age groups. The results showed that in all three age groups, distractions caused by mobile phones and passengers were ranked from first to third, and distractions due to eating and drinking, alcohol consumption, and sleepiness were in the last ranks. In addition, older drivers were ranked first in not identifying the distraction factors, and in the middle-aged group, the distraction caused by billboards was the leading cause of crashes.

### DISCUSSION

According to the results, the importance of distracting factors varies between age groups; this fact was also reported by different studies.<sup>[33-35]</sup> In the present study, the distraction caused by mobile phone use was the most important factor of crashes in all three age groups. Among the young drivers, it is the leading cause of rear-end crashes, because young drivers use mobile phones more frequently and they have some sort of false self-confidence, which makes them believe that they can both drive and use mobile. Spyropoulou and Linardou<sup>[36]</sup> showed that the effect of mobile phone use on driving behavior (maximum driving speed, reaction time, and lateral position) is significant. Furthermore, a meta-analysis study by Caird *et al.* showed that receiving and sending text messages while driving had a negative effect on reaction time, crash performance, lateral control, longitudinal control, looking behavior, as well as mental workload.<sup>[37]</sup> Aging, with a positive effect on factors such as driving experience, personal attitudes, and beliefs (due to the passage of time, gaining experience, and information), and driving performance can affect the driver's distraction when using a mobile phone.<sup>[38,39]</sup> These results show that with the increase in age, drivers gain more experience in driving and the use of mobile phones (while driving) is decreased. The results of the present study, considering the mobile phone distraction, are consistent with the results of a 2016 study in Canada.<sup>[40]</sup> Vehicle occupants have been reported to be the source of distraction among drivers in different age groups, and in all three age groups, it has been the second leading cause of distractions in rear-end crashes. Furthermore, it can be said that the distraction factor by the passengers does not differ between different age groups of the drivers and has the same effect. The results of studies showed that talking to a passenger can result in increased crash risk and it has the highest average score of distraction among all types of distractions related to driving.<sup>[41-43]</sup> Older drivers are more likely to experience rear-end crashes because of not recognizing the distraction factors, while in young and middle-aged drivers, this cause of the crash is ranked fifth and sixth, respectively. This could be due to a defect in cognitive factors, which is emerged because of the aging of the drivers. Therefore, detection of the cause of distraction

**Table 2: Statistical analysis of the causes of distraction in different age groups**

Reason	Age			Total
	Young	Middle-aged	Elderly	
Mobile phone				
Count	61	26	6	93
Percentage within reason	65.6	28.0	6.5	100.0
Passengers				
Count	33	27	9	69
Percentage within reason	47.8	39.1	13.0	100.0
Billboards				
Count	24	30	4	58
Percentage within reason	41.4	51.7	6.9	100.0
Vehicle options				
Count	25	25	6	56
Percentage within reason	44.6	44.6	10.7	100.0
Not recognizing				
Count	17	13	11	41
Percentage within reason	41.5	31.7	26.8	100.0
Dreaming				
Count	15	14	5	34
Percentage within reason	44.1	41.2	14.7	100.0
Eating and drinking				
Count	5	3	3	11
Percentage within reason	45.5	27.3	27.3	100.0
Alcohol consumption				
Count	14	4	1	19
Percentage within reason	73.7	21.1	5.3	100.0
Fatigue and sleepiness				
Count	9	3	2	14
Percentage within reason	64.3	21.4	14.3	100.0
Total				
Count	203	145	47	395
Percentage within reason	51.4	36.7	11.9	100.0
Pearson $\chi^2$ asymptotic significance (two-sided)	0.007* (the reason for rear-end crashes differed significantly in age groups)			

\*It is significant with 99% confidence level.

**Table 3: Rankings of the causes of distractions in different age groups**

Rank	Causes of distraction in different age groups		
	Age category		
	Young	Middle-aged	Elderly
1	Mobile phone	Billboards	Not recognizing
2	Passengers	Passengers	Passengers
3	Vehicle options	Mobile phone	Mobile phone
4	Billboards	Vehicle options	Vehicle options
5	Not recognizing	Dreaming	Dreaming
6	Dreaming	Not recognizing	Billboards
7	Fatigue and sleepiness	Fatigue and sleepiness	Alcohol consumption
8	Eating and drinking	Eating and drinking	Eating and drinking
9	Alcohol consumption	Alcohol consumption	Fatigue and sleepiness

of older drivers is very different from other drivers. In the middle-aged group, the distraction caused by billboards was the leading cause of crashes, while it ranked fourth and sixth among young and older drivers, maybe because middle-aged drivers care more about notifications. Therefore, the distraction of billboards in middle-aged drivers is different from other drivers. Backer *et al.* also showed that looking at roadside billboards and searching for the address while driving is one of the most distracting factors for drivers.<sup>[44]</sup> Control of vehicle options (such as checking the radio and monitor) was more common as a distraction factor. Numerous studies have shown that tuning the radio is as distracting as the use of mobile phones.<sup>[45]</sup> Many other studies have shown that tuning the radio can reduce driving performance (more than a simple cell phone call), especially when driving in poor conditions.<sup>[46,47]</sup> However, considering the ratings of distraction factors in the present study, it is clear that the distraction factor of controlling car options does not vary between all the three age groups and they have obtained the same rankings. Dreaming was not considered a very important distraction factor among drivers of all age groups and some distraction factors such as eating and drinking, alcohol consumption, and sleepiness had the lowest frequency of rear-end crashes in different age groups and these factors had no significant difference in age groups and received the same rankings. This may be due to the statistical population of the present study that examined road traffic accidents in urban, because in urban driving, factors such as eating, drinking, and sleepiness are less common, and most of these factors are the cause of traffic accidents on suburban roads. Data of crashes are analyzed over 3- and 5-year periods; the limitation of the present study was the lack of access to 3- or 5-year statistics of rear-end crashes. The strength of this research was the accurate recognition of the reason for rear-end crashes through interviews with the person involved in the crash.

## CONCLUSIONS

Using a mobile phone and talking to the occupants were identified as the most important distracting factors in different age groups of drivers. Adopting appropriate policies, such as law enforcement and cultural interventions to prevent driver distraction, and to control the in-car conversation, and cell phone use while driving can be considered as effective interventions to prevent rear-end crashes. Enforcement of the law banning the use of mobile phones while driving, especially in young groups, creating a culture through social campaigns, and group training are among the interventions that have been implemented in different countries to reduce the use of mobile phones while driving and thus reduce rear-end crashes. In addition, the development and implementation of behavioral interventions based on personal behavior management theories can be effective in reducing the use of mobile phones while driving. Designing car options in an easily reachable way, the use of new technologies to control options, and providing information to the driver while driving like a head-up display

can be effective in reducing the distraction of drivers. On the other hand, the development and implementation of visual safety standards in the installation of road signs and billboards are very important in reducing drivers' distractions, which requires further studies.

## Ethical considerations

According to letter number "1400-10-969" from the Industrial Management Organization, the ethical rules for the thesis on "Driver's Age and Rear-End Crashes Associated with Distraction" are approved. This paper is an excerpt from the PhD thesis in Doctorate of Business Administration (DBA).

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## Conflicts of interest

There are no conflicts of interest.

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