Assessment of Reasons for Driver Speeding and Estimation of Penalty Probability

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Abstract. Road safety is a global issue that requires a scientific approach to develop safety research methodologies that lead to sound conclusions. Regarding driver behavior and safety, speed is one of the leading causes of traffic accidents, injuries, and deaths. Speed is, therefore, one of the most studied issues related to road safety. The main objective of this study is to identify the frequency and reasons for a driver speeding in Baghdad city. In addition, drivers have been evaluated in terms of penalty probabilities, penalties imposed, and their type. Finally, this paper also investigated drivers' opinions on the effectiveness of such penalties in changing speed behavior. Eight hundred sixteen drivers were the studied sample in Baghdad city for three years. As a result, it was found that about one-third of the drivers were either driving too fast all the time or sometimes. Among the particular reasons, the most common was the rush, not realizing the speed, limits were too low, or the conditions allowed it. Similarly, the chances of getting caught are considered limited. Additionally, half of the penalized drivers said their speed habits changed due to such penalties. A speeding driver is fully aware that they are violating traffic rules. Approximately 80% of the circumstances for speeding behavior were intended. They are unaware of the dangers of speeding, citing speed limits that are too low and that it is customary when road conditions permit.

Keywords: Driver speeding; driver behavior; traffic accidents; traffic penalty; road safety; speeding behavior; traffic violation.

1. INTRODUCTION

One of the most important risk factors in road traffic is speed. Improper speed accounts for a large proportion of traffic accidents. Traffic crashes and their severity were influenced by driving speed. Many previous literature studies discuss speed behavior and accident risk [1,2]. The speed a driver expects on a particular road can be affected by many factors. The psychophysical state of the driver, personal preference, social pressure, characteristics of the vehicle, and all types of interactions among them influence the speed behavior, environmental and weather conditions, and road characteristics [3,4]. Related to driving, it is scientifically proven that higher speeds increase the time it takes to detect and react to an impulse, the distance the vehicle travels before the driver reacts to the obstacle or danger, and the distance required to stop the car, i.e., speeding eliminates the possibility of avoiding an accident [5,6,7]. In addition, high speeds reduce vehicle efficiency. Similarly, high-speed driving increases the impact of driver errors such as distraction and failure to maintain safe distances, increasing the likelihood of being involved in a traffic accident [8,9].

Since the driving style classification has been closely related to environmental sustainability, this matter has recently raised the interest of many scientists. The fact behind that is the minimization of road crashes by cautious driving behavior, in addition to the minimization of CO_2 emissions, the consumption of fuel, and the maintenance of vehicles [10, 11]. It was reported that there is a significant relationship between aggression and behaviors on roads and increased accident risk [11-15]. This fact resulted in remarkable research related to the evaluation and assessment of driver behavior and the effect of this behavior on road safety [10]. Driving behavior evaluation is essential for policy development, infrastructure design, and the construction of intelligent vehicle safety systems. As a result, there is necessary to realize the impact of driving behavior on road hazards and the performance of vehicles. Moreover, important procedures should be proposed to make driving behavior become better. Many factors can influence driving behavior, such as the ability of the driver, driver skills, driving duration and driver's disruption, driver experience, competence, and knowledge [16]. It is clearly known that young drivers have a higher traffic accident rate compared with others [17, 18]. Most researchers stated that female behavior is relatively better than that of male, resulting in lower accident risk [19]. Similarly, high-education level drivers behave better on roads than those of less education level [20]. The time of driving has a remarkable impact on driving behavior in which long distances result in more driving speed. [21]. Other factors such as the driving environment, the mobile phone, and the co-passenger can be considered distractions for drivers, and this, in turn, inversely affects driving behavior and road safety [22].

A responsible driver is one who follows the speed limit, operates the car, and refrains from using a smartphone or other electronic devices. His driving behavior is unaffected by feelings and moods [23,24]. Around the world, there are many traffic fatalities; they are the main cause of death for those under the age of 54 [25,26]. Every year brings more and newer to the road, worsening the traffic and safety issues [27,28]. According to estimates, driver error is to blame for 94% of traffic accidents [29]. These mistakes, which collectively account for 41%, 34%, 10%, and 7% of crashes, are broadly categorized as recognition, choice, performance, and non-performance errors. Non-performance faults are typically random, make up a small proportion of driver defects, and are challenging to fix [30].

Driver error is the primary cause of traffic accidents. Automakers and researchers are constantly working to produce vehicles with cutting-edge properties, minimize human intervention in driving, influence driver behavior, improve safety, and have the best goal of full automation in the future [25]. Although many studies analyzing driving behavior have been carried out in recent years, some concerns remain to be addressed.

2. MATERIALS AND METHOD

1.1 The Questionnaire

Five sections of the questionnaire have been used in this study. General demographic information such as age, gender, nationality, occupation, and level of education has been included in the first part. The second section contains data on driving characteristics such as mileage, driving skill, and type of vehicle. The third part includes questions about the reasons for speed, speed choice on different roads, and average speed. The questionnaire also included several questions about the impact of medication and listening to music while driving, determining their impact on driver behavior and driving speed. Questions about possible traffic penalties and their impact on changing this behavior and commitment to the speed limits are included in the fifth section. Five roads in Baghdad city were chosen to represent highways and internal arterial roads. The roads are (Mohammad Al-Qasim Highway, Baghdad Airport Highway, 14th Ramadan Street, Al-Qanat Highway, and Palestine Street).

1.2 Participants

The questionnaire survey was randomly distributed to drivers in Baghdad city for three years, between October 2019 to October 2022. A total number of 1000 questionnaires were distributed to randomly sampled drivers in various locations within Baghdad city. Based on 184 surveys, out of the responses returned were rejected because they were incomplete or the responses were deemed unrealistic, resulting in an overall response rate of 82%. A total of 816 drivers, all with driver's licenses, participated in the study. The demographic characteristics of the respondents are presented in Table 1. It can be noticed that men are the predominant majority (81%).

Table 1: Demographic characteristics of the respondents.

Age group	18 – 24	15%
	25 – 39	38%
	40 – 54	27%
	Over 55	20%
Gender	Male	81%
	Female	19%
Education Level	Primary school or below	6%
	Secondary school	30%
	Bachelor's degree	47%
	Postgraduate	17%

3. RESULTS AND ANALYSIS

According to the responses of the drivers in the questionnaire, the average speed on the selected roads is presented in Table 2. As a consequence of the speeding behavior, the participants asked about the impact of overspeeding as causing traffic accidents, causing harm to others, or loss of control. They rate them as first, second, and third. The results as illustrated in Figure 1. According to data analysis, 9% of drivers admitted to not speeding. On the other hand, 55% said they sometimes drive too fast. At the same time, 30% of drivers stated to be always or often fast (Figure 2). There was a remarkable gender difference ($F(1.1092)=55.609$, $p≤0.05$). Male drivers were always fast. Young people aged 18 to 24 are more accelerated drivers. But once they are over 40, speeding is less likely. However, these age-related differences were not significant. Similarly, speeding generally refers to drivers driving on highways and principal arterials. However, there was no significant statistical difference or significant statistical association between speeding frequency and drivers' level of knowledge of traffic rules. There were no significant statistical differences or a significant statistical relationship between the frequency of speeding and the level of knowledge the driver showed on traffic rules.

Table 2: Average speed on the selected roads used by respondents.

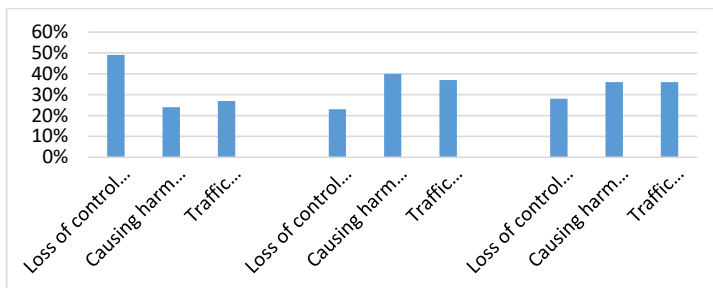| **Roads**	**Average speed**
Mohammed Qasim Highway	110 km/h
Al-Quanat Highway	100 km/h
The Airport Highway	130 km/h
14 Ramadan Street	70 km/h
The Palestine Street	70 km/h
Dora Highway	110 km/h

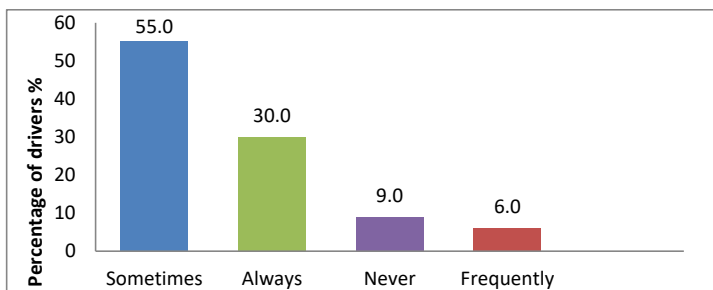Figure 1: Probability of consequences when exceeding the speed.

Figure 2: Distribution of drivers according to the frequency of speeding.

According to the type of road, the results of the questionnaire indicated that the proportion of drivers who drive quickly on the exterior highways was 51%. In contrast, those who drove quickly on the interior highways was 33%, while the driving fast on the arterial road was 5%, as illustrated in Figure 3. 'Hurry' or 'emergency' was the most common reason drivers were driving too fast, at 32%, followed by lack of concentration at 27%. While 5% of people speed because they feel excited or fun when speeding, as presented in Figure 4. As drivers did not speed, 38% said they could be involved in a traffic accident, and 14% did not like driving too fast. Other reasons for not accelerating are caution and safety; speeding should be avoided. Traffic rules must be respected. It is better to drive for a lot of time than to drive too fast to avoid penalties, traffic or car does not allow speeding, and do not have enough experience. The results obtained from the questionnaire showed that 58% of the drivers feel safe when they comply with the speed limit, 17% think they are wasting time, 17% will arrive late to work, and 8% think they reduce the driver's freedom, as shown in Figure 5.
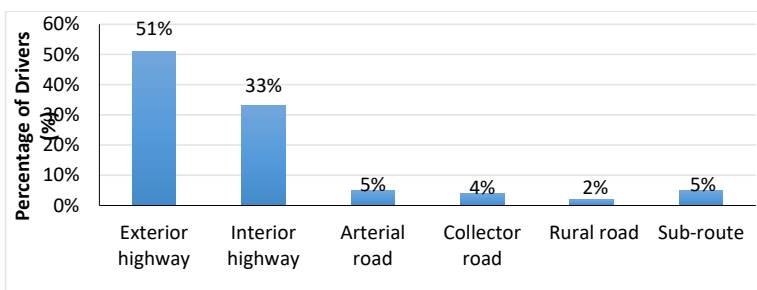

Figure 3: Distribution of drivers who drive quickly on the roads.
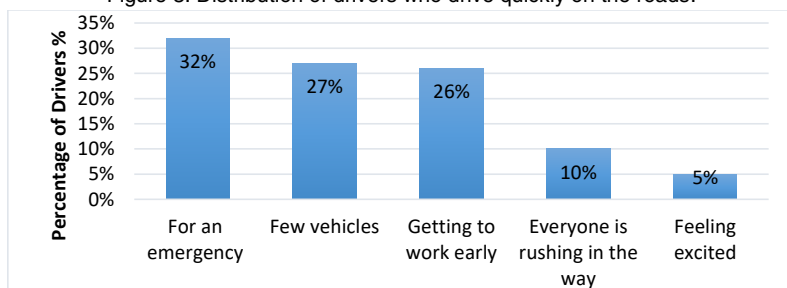

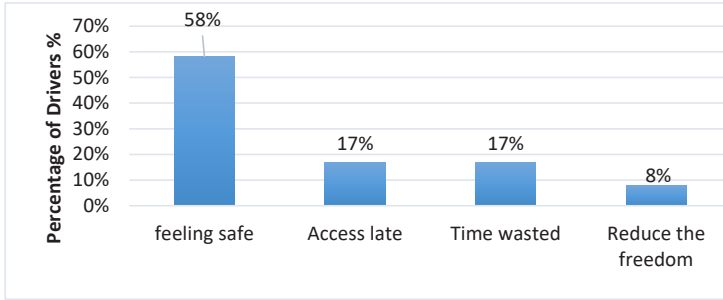Figure 4: Distribution of drivers by reason for speeding.

Figure 5: Drivers' belief when they commit speed limits.

Regarding the impact of medication and listening to music while driving on driver behavior and driving speed, the questionnaire analysis showed that the proportion of drivers who believe that drugs and listening to music lead to an increase in speed is 75%. At the same time, 13% believe that their speed is not affected by medication or listening to music, as illustrated in Figure 6. When participants were asked what they thought about the speeding behavior, whether it was acceptable or not, 63% of the drivers said that this speeding behavior was unacceptable, while 37% said it was acceptable. Figure 7 illustrates these results. When analyzing the questionnaire results, it was found that the percentage of drivers who own a valid driving license was 72%. In contrast, the drivers who do not have valid driving licenses accounted for 28%, as indicated in Figure 8.
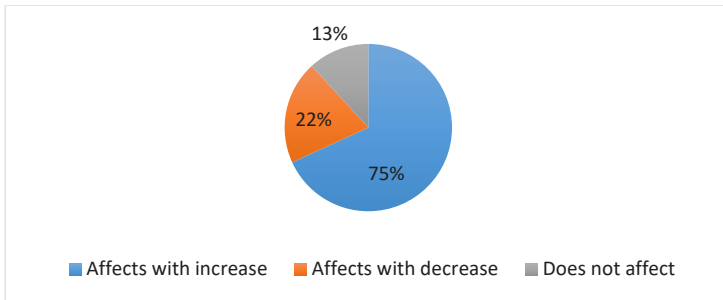

Figure 6: The impact of medication and listening to music on driving speed.
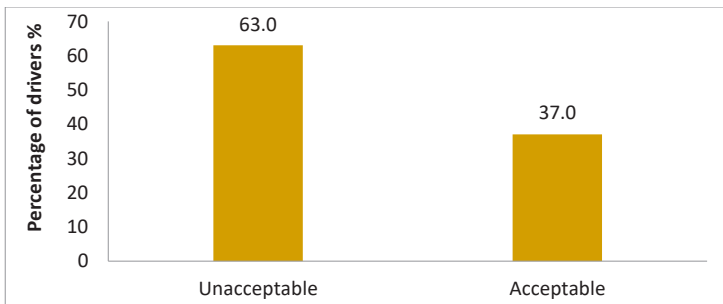

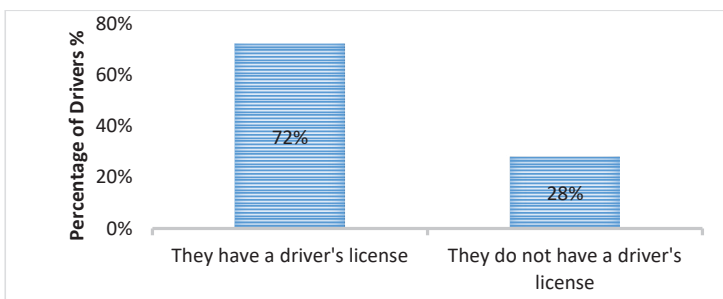Figure 7: Percentages of rejection and acceptance of speeding behavior.

Figure 8: Percentage of drivers who have or do not have a valid driver's license.

Regarding the fines or penalties which had been given to drivers due to overspeeding, it was found that the percentage of drivers who did not get a traffic fine was 81%, and those who received a traffic fine was 19%, as shown in Figure 9. Also, the percentage of drivers affected by traffic fines due to speeding was 53%, while those who were not affected by the traffic fines were 47%, as presented in Figure 10.
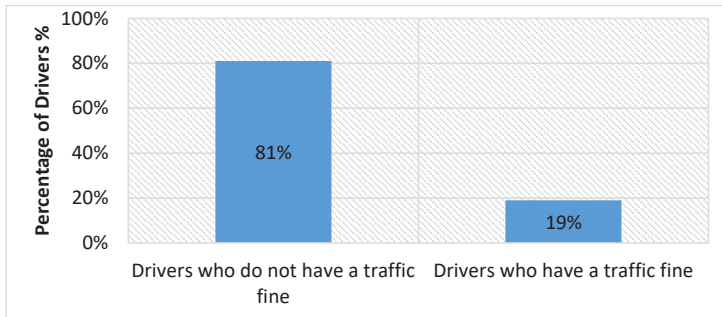

Figure 9: Percentage of drivers who received or did not receive a traffic fine due to speeding.
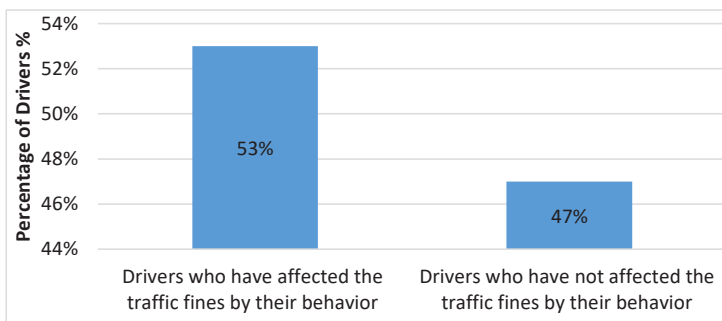

Figure 10: Percentage of drivers affected by speeding fines.

In order to avoid or reduce speeding behavior in the future, the questionnaire results revealed that the percentage of drivers who agreed to apply a high fine due to high speed was 75%. In comparison, those who did not agree are 25%, as shown in Figure 11. Similarly, the percentage of drivers who agreed to withdraw their driver's license when the speed exceeded the specified limit is 54%. In comparison, those who did not agree are 46%, as illustrated in Figure 12. In order to avoid or reduce speeding behavior in the future, the questionnaire results revealed that the percentage of drivers who agreed to the vehicle reservation for a period of time when the speed exceeded the specified limit is 45%. In comparison, those who did not agree is 55%, as shown in Figure 13. The questionnaire survey also showed that the percentage of drivers who agreed to prevent the driver from driving for some time when exceeding the speed limit is 56%. In contrast, they did not agree 44%, as illustrated in Figure 14.
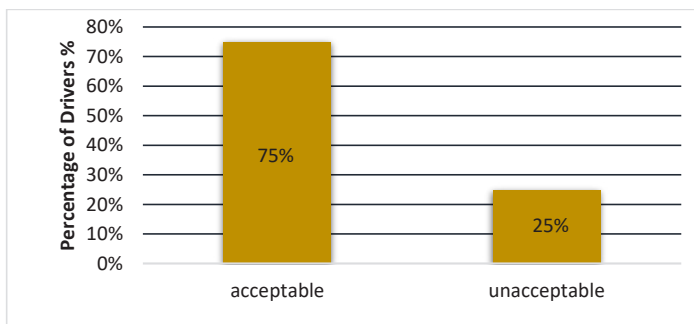

Figure 11: Percentages of rejection and acceptance of imposing a high fine when overspeeding.
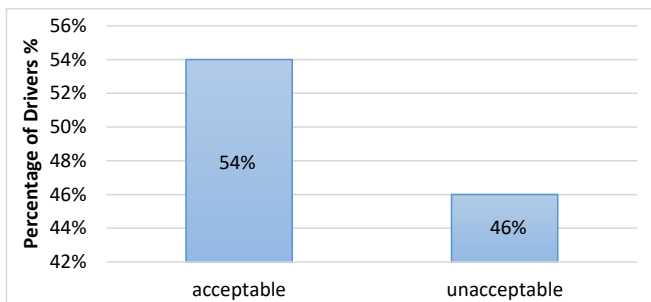
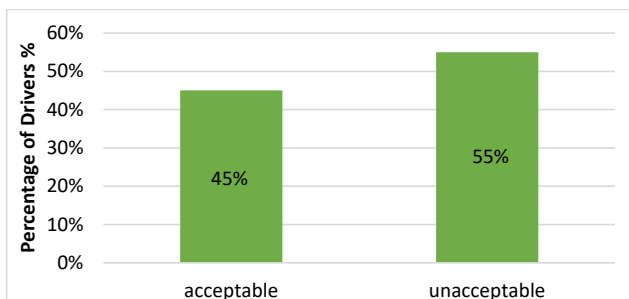Figure 12: Percentages of rejection and acceptance to withdraw the driver's license when over speeding.

Figure 13: Percentages of rejection and acceptance to detention of the vehicle when overspeeding.
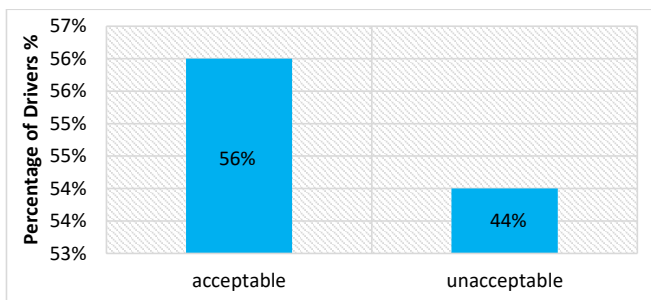

Figure 14: Percentages of rejection and acceptance to prevent the driver from driving for a period of time when overspeeding.

4. DISCUSSION

The obtained result of 30% of drivers admitted that they always and (55%) of drivers who sometimes speed show an urgent need to modify this behavior as it is the most common cause of traffic accidents. So, speeding behavior is one aspect that needs to be assessed to reduce traffic accidents. In addition, roads should be improved, such as setting permissible speed limits and installing appropriate signs. Additionally, using in-vehicle tools and technology may be important to advise and govern speeding to enhance safety. However, because the driver makes the ultimate speeding decision, the need to establish policies, education, awareness, programs, and driver training is much greater.

Involving the number of drivers with multiple penalties and those who always break the rules (after being sanctioned) is essential to be included to assess their trust, understanding, attitudes, motivations, driving style, knowledge, feelings, and circumstances. Understanding the motives or reasons drivers speed is the basic idea in which interventions should be designed and applied. In this context, it is obvious that people's education is a necessity from childhood. In the context of both school and family, not only the informational side but also the teaching and learning side comes to the fore.

It is essential to begin the steps of education and understanding road safety before breaking the traffic rules themselves. It is clear that there is an urgent need for design strategies and programs aimed at encouraging regular tachometer checks, especially when exiting the highway. This will improve proper knowledge of speed limits (especially paying attention to signs at intersections), raise awareness of the impact of speeding on other drivers, and ensure that speeds posted on signs are speed limits to inform the driver that it is not the speed it should be driving; considering that many drivers are unaware of the dangers of speeding and their behavior on the road is characterized over time by becoming consistent habits on different types of

roads. Therefore, it is important to define the aspects that provide information about the speed limit, the idea of the speeding causes, the situations that can be avoided, and the advantages gained from driving at a reasonable speed.

On most occasions, drivers pointed out that the limit was too low or the road conditions allowed speeding. Therefore, it is necessary to guide the driver to adjust speed according to road conditions, make traffic flow smoother, avoid wrong actions, and correct mistakes while driving. A low or no penalty or a small fine sometimes encouraged drivers to speed. Therefore, police surveillance must be increased through traditional automated methods (fixed or mobile cameras), and severe fines should be imposed for speed limit violations.

5. CONCLUSIONS

In the current study, the following results were obtained:

- A significant of 30% admitted they always speed, and 55% of drivers sometimes speed. Young people aged 18 to 24 are more accelerated drivers. But once the driver is over 40, the chances of speeding go down. It has also revealed that speeding is more frequent among male drivers.
- Exterior highways and interior highways were the roads on which drivers usually sped. Similar trends are observed in other countries regarding various aspects related to speeding.
- Of the reasons a driver speeds, it was concluded that 32% of the main reasons are rushing or emergency, while 5% of drivers speed because they feel excited or fun when speeding. However, 63% of the drivers are satisfied that the speeding behavior is unacceptable, while 37% stated that it is acceptable.
- Regarding the impact of medication and listening to music while driving on driver behavior and driving speed, the results presented that the proportion of drivers who believe that drugs and listening to music lead to an increase in speed of 75%. At the same time, 13% believe that their speed is not affected by medication or listening to music.
- The obtained results revealed that the percentage of drivers who own a valid driving license was 72%, whereas the drivers who do not have valid driving licenses accounted for 28%. Regarding the fines or penalties which had been given to drivers due to overspeeding, it was found that the percentage of drivers who did not get a traffic fine was 81%, and those who received a traffic fine was 19%. So, there is a necessity to increase the police supervision of traditional and automated methods (fixed or mobile cameras) to impose a strict high penalty for not having a valid driving license or for speeding.
- Regarding imposing a penalty, the percentage of drivers who agreed to apply a high fine due to high speed was 75%. Similarly, the percentage of drivers who agreed to withdraw their driving license when the speed exceeded the specified limit is 54%, regardless of age and gender. The results also showed that the percentage of drivers who agreed to prevent the driver from driving for a period of time when exceeding the speed limit is 56%, whereas those who did not agree is 44%.
- Also, drivers justify their actions because the speed limit is too low, road conditions allow, etc., so they are unaware of the danger of overspeeding or believe it is a habit, excitement, or pleasure.

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