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Identifying the Factors Affecting the Choice of Advanced Driving Education in the Context of Traffic Security

Arzu Altın Yavuz[*], Murat Karacasu[**], Barış Ergül[***]

Abstract: Vehicle traffic in highway networks is accompanied by an increase in traffic accidents. Drivers who are trafficked after driver's license exams can experience shortcomings in their experience. Advanced driving education is an education that has significant benefits for both drivers and other elements of traffic. The success of the education to be received is directly proportional to the desire of the individuals to receive education. This research was carried out in Eskisehir in Turkey, one of the major cities. Firstly, the factors that constitute the traffic perception of the drivers in Eskişehir were tried to be determined. It was then attempted to model how driver views on advanced driver training were affected by these factors. For modelling, logistic and robust logistic regression analysis methods are used. Traffic safety, driver behaviors, driver capacities and factors affecting traffic perceptions have been tried to be determined depending on Eskisehir traffic and socio-cultural structure.

Keywords: Traffic Accident; Traffic Security; Traffic Perception; Advanced Driving Education; Factor Analysis; Robust Logistic Regression.

* Prof., PhD., Science and Letter Faculty, Department of Statistics, University of Eskişehir Osmangazi, Eskişehir, Turkey, aaltin@ogu.edu.tr, ORCID ID: 0000-0002-3277-740X.

** Prof., PhD., Faculty of Engineering and Architecture, Department of Civil Engineering, University of Eskişehir Osmangazi, Eskişehir, Turkey, muratk@ogu.edu.tr, ORCID ID: 0000-0001-9721-0984.

*** Res. Assis., Science and Letter Faculty, Department of Statistics, University of Eskişehir Osmangazi, Eskişehir, Turkey, bergul@ogu.edu.tr, ORCID ID: 0000-0002-1811-5143.

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Trafik Güvenliği Bağlamında İleri Sürücü Eğitimi Tercihini Etkileyen Faktörlerin Belirlenmesi

Arzu Altın Yavuz, Murat Karacasu, Barış Ergül

Öz: Karayollarındaki araç trafiği, trafik kazalarında artışa sebep olmaktadır. Ehliyet sınavlarından sonra trafiğe çıkacak sürücüler, deneyimlerinde eksiklikler yaşayabilirler. İleri sürüş eğitimi, hem sürücüler hem de trafiğin diğer unsurları için önemli faydaları olan bir eğitimdir. Alınacak eğitimin başarısı, bireylerin eğitim alma isteği ile doğru orantılıdır. Bu araştırma Türkiye›nin önemli şehirlerinden biri olan Eskişehir›de yapılmıştır. Öncelikle Eskişehir›deki sürücülerin trafik algısını oluşturan faktörler belirlenmeye çalışılmıştır. Ardından ileri sürücü eğitimine ilişkin sürücü görüşlerinin bu faktörlerden nasıl etkilendiğinin modellenmesi üzerinde durulmuştur. Modelleme için lojistik ve sağlam lojistik regresyon analizi yöntemleri kullanılmıştır. Bu çalışmada, Eskişehir trafiğine ve sosyo-kültürel yapısına bağlı olarak; trafik güvenliği, sürücü davranışları, sürücü kapasiteleri ve trafik algısını etkileyen faktörler belirlenmeye çalışılmıştır.

Anahtar Kelimeler: Trafik Kazası; Trafik Güvenliği; Trafik Algısı; İleri Sürücü Eğitimi; Faktör Analizi; Robust Lojistik Regresyon.

Introduction

One of the most important problems of the world is traffic safety with its social and economic dimensions. The World Report on Road Traffic Injury Prevention, prepared in partnership with the World Health Organization (WHO) and the World Bank has noted that traffic accidents are a major public health problem and 20-50 million people have been injured, an average of 1.2 million people are killed each year in traffic accidents (WHO, 2013, p. 8). It has also been underlined that the traffic accidents alone accounted for 2.1% of all deaths worldwide, 8th in death causes, with upward acceleration (Peden, 2004, p. 34). Also, 85% of the injuries caused by traffic accidents nowadays occur in low or middle-income countries (Peden, 2004, p. 8).

Turkey with the entire transport system, including the structure and geographical location, particularly as sea route has a much more balanced and common opportunities that can be used. However, 83% of freight transport and 90% of passenger transport are provided by road. This ratio is well above the European average. The fact that traffic safety and driver behaviors are especially important in our country is because road and passenger transportation is carried out by the road. As of the end of 2019, there are 23.496.847 vehicles and 30.541.611 drivers in our country. When we examined the accident statistics of the last ten years, we saw that approximately 10.898.455 traffic accidents occurred, 40.275 of our citizens lost their lives and 2.040.884 of our citizens were injured in these accidents. In 2019, 1.168.144 traffic accidents occurred, resulting in 174.896 deaths and injuries. In these accidents, 5.473 people lost their lives and 283.234 people were injured.

Traffic accidents bring along economic and social losses. While it is possible to compensate for economic losses, it is not possible to compensate for social losses. Traffic accidents happen due to road conditions, traffic intensity, vehicle speed, climate and weather conditions, driving experiences and drivers' behaviors (Juhnke et al., 1995, p. 51; Ram and Chand, 2016, p. 163). Driver defects constitute the first order with 89.3% of the basic defects causing the accident. It is followed by pedestrians with 8.8%, road with 0.9%, vehicles with 0.6% and passenger defects with 0.4%. There are investigations of driving behaviors and affecting traffic safety (Elander et al., 1993, p. 281; Naatanen and Summala, 1976, pp. 15; Gehlert et al., 2014, p. 328).

Recent studies in road safety surveys are aimed at changing the general way of thinking about road safety (Stollof et al., 2007, pp. 20). It has been understood that existing road safety practices, such as legal, technical and infrastructure measures, alone will not guarantee further progress in reducing accidents and deaths (Wilson and Ward, 2011, p. 5). It is seen that the deficiencies in the existing legal structure, education, and ethical rules are important in preventing traffic accidents seems to be important. It is important that, in terms of the healthy operation of the

system, ethical rules, as well as legal sanctions, help to implement the rules. Regarding traffic safety, the sense of responsibility in individuals can be achieved through the creation of respectful and consistent social behaviors. While evaluating the solutions to the problems caused by the deficiencies in traffic safety, firstly finding out the problems in the existing structure and finding solutions afterwards will be an appropriate approach in the planning studies of traffic safety education (Aron et al., 2015, p. 32; Tolunay and Gökdeniz, 2002, p. 35). Traffic safety education; traffic laws that are determined by legal conditions, natural behaviors during the life of a person, and the work that must be done to ensure the safety of life and property of persons. Numerous studies on traffic safety perception have been published since 2000. It has been determined that social structure and regional diversity have different effects on traffic perception. To solve the speed problem in residential areas, Edmonton City investigated whether residents were aware of published speed limits and adopted speed management controls to reduce the published speed limit from 50 km / h to 40 km / h in six settlement areas. They used speed perceptions as a result of the study to evaluate their concerns about traffic safety issues (Shewkar et al., 2013, p. 5). Tortum et al. (2012, p. 69) ranked drivers, pedestrians, vehicles, passengers and road defects according to their activity levels from the main flaws that caused traffic accidents. Güner and Genç (2012, p. 43) showed that primary school students' opinions about media tools related to traffic safety were independent of the gender variable in their study. Besides, in the study, it was seen that the opinions of elementary school students regarding the media tools related to traffic safety did not differ according to the number of motor vehicles belonging to the parents of the students. Özen et al. (2014, p. 1) showed that individuals had insufficient knowledge about traffic rules and the authorities responsible for the traffic. Gökdağ and Atalay (2015, pp. 272) emphasized the negative effects of road traffic accidents were a big issue in Turkey. Shbeeb (2016, p. 1) surveyed with a total of 167 people in two different groups of Jordanian society (general public and road specialist). The respondents were asked to evaluate the safety measures already in effect. The results show that the government has taken effective but unsustainable measures. Pirdavani et al. (2016, p. 1) tried to measure traffic safety anxiety and the effect on travel mode selection in 2016 with the help of a questionnaire. In this study, questions were asked about the perception of traffic safety, thoughts about situations that could lead to an accident, and probable collision severity. As a result, they determined that public transport was the safest option, while motorcycling and cycling are the most dangerous travel options.

Accidents in our country are closely related to human beings. The driver is a human and countless factors affect human behavior. Many factors such as a person's physiology, psychology, current fitness, disability, age, gender, driving experience, driving hours, etc. can affect the driver (Yüksel et al., 2016, p. 52). Studies have shown that the characteristics of drivers differentiate their rates of

involvement in traffic accidents. For this reason, it is very important to determine how much a person cares about the behavior in traffic, the perspective of traffic and the importance of traffic safety, and whether it complies with the traffic rules.

This study aims to determine the factors which constitute the traffic perception in Eskişehir and to model the views of the advanced driving education that these factors by logistic regression analysis and robust logistic regression analysis methods. Research is which was held in Eskişehir. Factors affecting traffic safety, driver behaviors, driver capacities and perceptions in traffic have been tried to be determined depending on Eskişehir traffic and socio-cultural structure. Individuals included in the survey were asked to rate the expressions on the questionnaire according to the 5-option Likert scale type and were asked to mark one of the following: "I agree absolutely (5) I agree (4) I do not understand (3) I do not agree (2) I do not agree".

The remainder of this paper is organized as follows: Section 1.1 presents the basic concepts. The sampling method is given in Section 1.2. Section 2 presents the statistical methods discussed. In Section 3, the results of the analysis of the data obtained through the questionnaire are given. Finally, in Section 4, conclusions and recommendations are given.

Basic Definitions

Traffic is the movements of human beings animal, vehicles on highways (Road Traffic Law). In a broader sense, it can also be defined as the movement of highways, animals, vehicles, etc. marked by lines, plates, lights, etc. adapted to the international rules most suitably for transportation purposes that is using them in a system that is constantly controlled (Karatekin, 1998, p. 2).

The road is one of the most important infrastructural investments made by the human is the commonplace of mankind, the fields were economical, commercial and social activities of countries are realized. The roads are the basis of the transport system. Roads are known as the highway which is open to the use of the public for all types of vehicles and pedestrian access (Gürer, 2011, p. 1).

Traffic Rules is following the law no. 2918, it is the rules (Türkiye Karayolları Kanunu) that determine the measures to be taken on all roads related to traffic safety and traffic regulation on the roads in terms of safety of life and property.

Perception is that taking, interpreting, selecting and organizing sensory information in the science of psychology. Perception consists of the signals in the nervous system that are generated by the physical stimulation of sensory organs. In this sense, perception varies from person to person. Perception in traffic, traffic safety, and traffic that varies according to the person are closely related to the behavior of drivers and pedestrians in traffic. Perceptual illusions can contribute to preventing accidents while leading to traffic accidents on the one hand (Amado, 2002, p. 65).

Sampling Plan

To reach the final units to participate in the study, a sampling plan has been implemented through the primary schools in terms of reflecting the socio-cultural structure of Eskisehir. The sample was selected with stratified sampling method from the primary schools in the two central districts of Odunpazarı and Tepebaşı, where the traffic intensity of Eskişehir province is the highest. It has been tried to reach the families and drivers who are the final research unit through the primary schools in the city of Eskişehir. For this purpose, it has taken the list of the primary schools providing education and training in Eskişehir province centre from the National Education Directorate. Many students were selected from these schools.

In the selection of the sample, the simple stratified sampling method is used which is one of the probability sampling methods. Firstly, due to the difference in regional structures, Tepebaşı and Odunpazarı municipalities were evaluated at two different layers and the primary schools providing education in these regions were used to form two layers. Equation 1 is used to calculate the number of units to be sampled (Yamane, 2001, p. 240).

$$n = \frac{N*\sum N_h*S_h^2}{N^2*D^2+\sum N_h*S_h^2} \quad (1)$$

S^2_h in Equation 1 shows the variances related to strata. Since there is no variance information available for this study, variances can be estimated for another feature. The variance estimates for the strata are calculated by taking into account the number of teachers who are teaching in the institution. Another value of D^2, which is included in the calculation of sample volume, is as in Equation 2 (Esin et al., 2001).

$$D^2 = \frac{d_0^2}{z_0^2} \quad (2)$$

Here (d_0) shows the estimated sensitivity and is taken as 0.10 in the study. The value of is the confidence level and is taken as 2.33 for 99% of the reliability of the estimates. The values of in Equation 1 indicate the strata sizes. A proportional allocation was used for the stratification of the sample, and the number of units to be analyzed from each layer was calculated with the help of Equation 3.

$$n_h = \frac{N_h}{N} * n \quad (3)$$

With the help of Equations 1 and 2, the number of units to be investigated in the survey was calculated as (n) 11197. Although this value does not seem to be very high at first glance, the research must be completed healthily, considering the number of units to be examined from the strata and the incoherent errors. A questionnaire was applied to the relevant schools and institutions during fieldwork. The collected surveys were firstly reviewed and 230 surveys were excluded due to various response errors. The total number of valid questionnaires obtained through primary schools in the provinces of Tepebaşı and Odunpazarı is 10967. These surveys were analyzed for the general evaluation of Eskişehir province. All statistical analyzes were performed using the SPSS package program and the R programming language.

Method

Multivariate statistical methods provide the necessary information for appropriate solutions to the structure of the problem being solved by determining the structure of the variable set that is formed by multiple variables and converting them into a simpler form. These statistical methods allow the measurement and explanation of mutual relations between groups of variables.

In this study, factor analysis was applied to the questionnaire data and the factors affecting the traffic perception were determined. These factors are that opinions on the subject of advanced driving education were classified. In this way, the factors that influence the vision of advanced driving education have been determined. There are many techniques for performing the classification process. However, the literature does not focus on the reliability of these techniques. As with all statistical techniques, the validity and reliability of the results obtained from these techniques depend on the provision of the necessary assumptions. For this reason, more than one classification technique has been discussed in this study and it has been mentioned which one should be preferred according to the situations that can be encountered in practice.

2.1. Factor Analysis

Factor Analysis is a multivariate statistical technique that attempts to obtain a linear structure smaller than the data set (Anazawa and Ohmori, 2001, p. 810). Factor analysis is defined as the process of obtaining the functional definitions of concepts using the factor loadings of the relevant items/variables. Thus, it is possible to reduce many items/variables in several dimensions. Each of these dimensions is called a factor. The purpose of factor analysis is to determine whether it belongs to variables that are not directly observable, based on directly observed items/variables. Another aim is to maximize the variance of items/variables and to derive a set of items/variables called dimension (Khalaf, 2007, pp. 50). The maximum likelihood technique used in factor analysis is based on the maximum

likelihood of the correlation matrix observed for the sample. This technique is more useful and is used to determine factor loads for the universe (Rummel, 1970, p. 101; Yong and Pearce, 2013, p. 83).

If the observed variables are (*X1*, *X2* …,*Xn*), the common factors are (*F1*, *F2* …,F_m) and the unique factors are (*U1*, *U2* …,U_n), the variables may be expressed as linear functions of the factors:

X1 = a11F1 + a12F2 + a13F3 + … + a1mFm + a1U1

X2 = a21F1 + a22F2 + a23F3 + … + a2mFm + a2U2

….

Xn=an1F1+an2F2 + an3F3 + … + anmFm + anUn (4)

Each of these equations is a regression equation, factor analysis seeks to find the coefficients *a11*, *a12* … *anm* are weighted in the same way as regression coefficients (Yong and Pearce, 2013, p. 81).

Logistic Regression

The classification problem is a statistical decision-making process. At this level, there are two types of decision-making processes for the researcher. Determine the variables that provide discrimination by examining the distinguishing characteristics of the group; the other is to assign individuals to groups with the aid of these distinctive functions. Logistic regression analysis is used in cases where groups are known beforehand. The main purpose of the logistic regression analysis is to try to explain the causality relationship between the independent variables and the dependent variable with at least the help of variables as it is in the other regression methods. There is no assumption that the dependent variable is continuous in the logistic regression method, especially when the dependent variable has two or more qualitative values (Hair et al., 1995, p. 548).

Logistic regression analysis is a statistical technique aimed at establishing a relationship between a dependent and multiple independent variables. The advantage of the logistic regression analysis is to calculate the expected likelihood of each observation value (Lemeshow and Hosmer, 2000, p. 48).

The multiple logistic regression model is expressed as:

$$\ln\left(\frac{\pi}{1-\pi}\right) = X'\beta + \varepsilon\ ;\ \pi = \frac{\exp(X\prime\beta)}{1+\exp(X\prime\beta)} \quad (5)$$

In this model, the natural logarithm of the dependent variable, encoded as 0 or 1, is known as “logit”. The other variables are X: *p*x1 dimensional *p* independent vector and β: *p*x1 dimensional regression vector. The odds ratio of the likelihood that an event will occur is known as Odds Ratio (OR).

Odds Ratio (OR) is equal to exp(). When other factors are constant, an independent increment of one unit increases Odds by exp(). When there is a unit increase in the independent variables, the odds value of the dependent variable increases (OR is more than 1) or decreases (OR is less than 1) (Lemeshow and Hosmer, 2000, pp. 74). The change range for OR is [0, ∞] (Zhang and Yu, 1998, p. 1691).

Robust Logistic Regression

When working with real data sets, outliers can be found in the data sets. Outliers can be defined as values that differ greatly from the overall extent of the data. If there are outliers in the data set while performing the logistic regression analysis, these outliers influence the probability of obtaining the 0-1 values of the dependent variable. If the outlier values are less likely to be successful, then the observed situation is successful, and if the likelihood of success is high, the observed situation is determined to be unsuccessful (Yavuzkanat, 2011, p. 57). In this case, the robust logistic regression model is used, which yields more accurate estimates by minimizing the effect of outliers. Robust methods increase the reliability and validity of the results obtained from the applied statistical method because it reduces the effect of outliers and assumption disruption the least. An M-estimator, the Bianco and Yohai (1996, p. 18) estimator, is a suggested estimator for Robust Logistic Regression. The Bianco and Yohai estimator is defined as follows:

$$\beta_n = \arg\min \sum_{i=1}^{n} \phi(Y_i, \pi(x_i'\beta)) \tag{6}$$

$d_i(\beta)$ are the variance of β in the function $\phi(Y_i, \pi(x_i'\beta)) = \tilde{n}(d_i(\beta)) + \tilde{n}_0(\pi(x_i'\beta))$

and $\tilde{n}(t)$ is a restricted function (Hobza et al., 2012, pp. 770).

Results

Frequency distributions of participants in the survey are shown in Table 1. According to the table, 76.1% of the 10967 individuals participating in the survey are male, 2.9% are females. Of the 10967 participants who participated in the survey, 59.2% were in the age range of 36-50 years, and 27.4% were in the age range of 31-35 years. 91.7% of the participants are married and 5.5% are single. Of the 10967 respondents in the survey, 39.2% were in high school and 37.1% were university graduates. 27.6% of the 10967 individuals participating in the study are the civil servant, 24.3% are private sector and 22% are workers.

Table 1. *Frequency Distribution of Demographic Questions*

Variable	Level	Frequency	Percent (%)
Gender	Male	8346	76.1
	Female	2621	23.9
Age	18-20	99	0.9
	21-23	176	1.6
	24-26	197	1.8
	27-30	559	5.1
	31-35	3005	27.4
	36-50	6492	59.2
	51-60	373	3.4
	60+	66	0.6
Marital Status	Married	10057	91.7
	Single	603	5.5
	Divorced	274	2.5
	Widow	33	0.3
Education	Primary school	2081	19.0
	High school	4308	39.2
	University	4063	37.1
	MSc/PhD	515	4.7
Profession	Civil Servant	3027	27.6
	Private	2666	24.3
	Tradesman	1075	9.8
	Worker	2413	22.0
	Retired	450	4.1
	Student	196	1.8
	Housewife	1140	10.4

An analysis of the reliability of the questionnaire consisting of 33 questions mentioned in Table 2 was made. Cronbach's alpha value was found to be 0.721. Cronbach alpha value can be said that the reliability of the questionnaire is high because it is in the range of 0.7-1.0. The reliability analysis results are shown in Table 3.

Factor analysis was applied to the questionnaires by using the principal axis technique and the dimensions in which the variables/items were collected were tried to be determined. The results of the KMO and Bartlett test for the principal axis technique are shown in Table 4. The KMO test provides information on whether the sample is sufficient for factor analysis. The Bartlett test also gives a clue

as to whether the variables/items are suitable for factor analysis. As can be seen from Table 4, the value of the KMO test. 0.834, which is an indication that the sample is sufficient for factor analysis. Likewise, the significance value (*p*) for the Bartlett test was found to be 0.000. This result indicates that the variables/items are suitable for factor analysis.

The initial variance explanation ratio for the principal axis technique is as given in Table 5. Accordingly, there are 12 factors with an eigenvalue greater than 1. The first factor explains 16.055% of the total variance. Then, it is seen to explained 7.924% of the total variance by the second factor, 7.347% by the third factor, 5.987% by the fourth factor, 4.776% by the fifth factor, 4.065% by the sixth factor, respectively. 12 factors explain 65.158% of the total variance.

In Table 6, dimensions expressed by variables/items are shown. Factor-1: Traffic Regulation Perception of Sanction; Factor-2: Fear of Traffic Accidents; Factor-3: Advanced and Safe Driving Training Benefit Perception; Factor-4: Accidents Prevention After Advanced and Safe Driving Training (Accident Prevention after A.S.D. Training); Factor-5: Vehicle ownership perception; Factor-6: Perceptual questions on car inspection (Vehicle/Car Inspection); Factor-7: Traffic risk perception; Factor-8: Vehicle fault detection; Factor-9: Vehicle prestige gauging perception; Factor-10: Vehicle use perception; Factor-11: Perception of application of traffic rules and the Factor- 12: Perception of the traffic violation.

Table 2. *Traffic Perception Questions*

TRAFFIC PERCEPTION ITEMS
1) It was very easy to pass the driver's license exam.
2) I feel aggressive myself when driving.
3) When the weather is dark and at night, I do not like to drive.
4) I am afraid of being involved in the accident as a driver.
5) I am afraid of being injured in traffic accidents and being crippled by a driver.
6) I am afraid to die in a traffic accident.
7) I can understand the mistakes of other drivers.
8) I do not stay in situations that will create risk in traffic.
9) I take a risk in traffic but I do not make an accident.
10) In vital situations, traffic rules remain meaningless.
11) I have a driver license but I do not know most traffic rules and signs.
12) Advanced and safe driving training must be mandatory for all drivers.
13) Getting advanced and safe driving training does make drivers more experienced.
14) Advanced and safe driving training is not a waste of time.
15) Advanced and safe driving training is a personal choice.
16) The roads would have been safer if all the drivers were trained in advanced and safe driving.

17) I believe that advanced and safe driving education will prevent traffic accidents.
18) It is good to provide discounts for advanced and safe driving education when driving insurance and car insurance.
19) I do not need a vehicle.
20) The vehicle provides status and prestige.
21) The cost of the vehicle and the insurance fees prevent it from driving.
22) The vehicle is a necessity.
23) You may know how a person is by looking at a vehicle.
24) The rate of alcohol given for driving is more than necessary.
25) Harder punishments must be applied to drivers who make a rule error.
26) No one using a vehicle nearby is aware of the danger.
27) The distances between motorways and police inspections are too high.
28) Drivers who are stopped by the police due to improper fading are unlucky.
29) I do the maintenance and inspection of the vehicle myself.
30) Vehicle inspection contributes to the reduction of traffic accidents caused by vehicle defects.
31) Vehicle inspection reduces the fuel consumption of the vehicle.
32) Vehicle inspection reduces noise pollution.
33) Vehicle inspection extends the life of the vehicle.

Table 3. *The result of Reliability Analysis*

	Value	Number of Items
Cronbach's Alfa	0.721	33

Table 4. *KMO and Bartlett Tests for the Traffic Perception of the individuals living in Eskisehir Province*

Test	**Value**
Kaiser-Meyer-Olkin Test	0.834
Bartlett Test Chi-Square	44123.803
Degree of Freedom	528
Bartlett Test p-value	0.000

Table 5. *The result of the Principal Axis Technique for the Traffic Perception of the individuals living in Eskisehir Province*

	Initial	Eigenvalue		Rotated	Factor Loadings	
	Total	**Variance %**	**Cumulative%**	**Total**	**Variance %**	**Cumulative %**
1	5.298	16.055	16.055	3.792	11.491	11.491
2	2.615	7.924	23.979	2.275	6.894	18.385
3	2.425	7.347	31.326	2.082	6.311	24.696
4	1.976	5.987	37.313	2.064	6.254	30.950
5	1.576	4.776	42.089	1.704	5.165	36.114
6	1.341	4.065	46.154	1.607	4.870	40.984
7	1.237	3.749	49.904	1.534	4.647	45.631
8	1.134	3.436	53.340	1.383	4.190	49.821
9	1.071	3.246	56.586	1.380	4.182	54.003
10	1.037	3.144	59.730	1.281	3.882	57.886
11	0.917	2.780	62.509	1.277	3.871	61.756
12	**0.874**	**2.649**	**65.158**	**1.023**	**3.402**	**65.158**
13	0.835					
14	0.811					
15	0.756					
16	0.731					
17	0.724					
18	0.688					
19	0.643					
20	0.641					
21	0.622					
22	0.590					
23	0.548					
24	0.513					
25	0.510					
26	0.483					
27	0.463					
28	0.398					
29	0.351					
30	0.330					
31	0.318					
32	0.275					
33	0.67					

Table 6. *The result of Rotated Factors for the Traffic Perception of the individuals living in Eskisehir*

Item/ Factor	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
27	0.843											
25	0.831											
26	0.811											
28	0.785											
24	0.762											
5		0.898										
4		0.850										
6		0.800										
13			0.789									
14			0.765									
12			0.729									
16				0.736								
15				0.715								
17				0.702								
18				-0.503								
21					0.776							
22					0.770							
19					0.608							
32						0.723						
31						0.706						
33						0.646						
8							0.849					
7							0.822					
30								0.741				
29								0.688				
23									-0.815			
20									0.774			
1										0.854		
2										0.561		
11											0.773	
10											0.767	
3												0.830
9												-0.510

In the course of this study, it was aimed to model the opinions of the individuals participating in the survey on the subject of advanced driving training. For this purpose, a question was asked in the form of the questionnaire: “Do you want to study advanced driving?”. The advanced driving training as a dependent variable is coded as a two-level variable. The relevant variable was used as a dependent variable in the logistic regression analysis. Age, gender, occupation, educational status, and perception questions represented by 12 factors were analyzed as independent variables. The analysis results of the general significance of the logistic

regression model are given in Table 7. According to Table 7, the Hosmer and Lemeshow test statistic and -2 Log Likelihood value are used to test the fitness of the best model to explain the advanced driving education. The *p*-value obtained for the Hosmer-Lemeshow test is greater than the significance level of 0.05, and it is decided that the model is significant. Also, the calculated -2 Log-Likelihood value was obtained as 8.483. It is seen that this value is generally meant when compared with 3.84, which is the one-degree-of-freedom chi-square table value at the $\alpha = 0.05$ significance level. Based on all these results, it can be seen from Table 7 that the logistic regression model established with seventeen independent variables has a correct classification ratio of 68.3%.

Table 7. *The goodness of Fit for Logistic Regression Analysis Results*

Goodness of Fit	**Value**	**d.f.**	**P**
Hosmer and Lemeshow Test	8.483	8	0.388
-2 Log-Likelihood	636.961		
Correct Classification Ratio	68.300		

The results of the logistic regression analysis are as given in Table 8. As can be seen from Table 8, the coefficients are determined to be significant because the *z* statistic values obtained for the education, traffic risk perception, traffic rules sanction, vehicle ownership perception, and application of traffic rules perceptions are greater than 1.96. As a result of the logistic regression analysis, the OR value for the education variable was found to be 1,462. Because this value was found to be significant, it was determined that the educational status variable was a positively influential variable on advanced driving education. This result shows that one unit increase in education variable level when the other variables are held constant raises the probability of receiving advanced driving training. Similar interpretations can be made for other meaningful variables.

Table 8. *Results of Logistic Regression Analysis*

	$\hat{b}$	S.E.	Z	Exp($\hat{b}$)
Constant	0.347	0.273	1.270	1.415
Gender	-0.098	0.081	-1.228	0.907
Age	-0.042	0.035	-1.210	0.959
Marital Status	0.071	0.080	0.889	1.074
Education	0.280	0.042	**6.612**	**1.462***
Profession	0.019	0.020	0.940	1.019
Traffic Rules Sanction	-0.070	0.031	**-2.294**	**0.932***
Fear of Traffic Accidents	0.017	0.030	0.552	1.017
A.S.D. Training Benefit Perception	-0.011	0.030	-0.350	0.989
Accident Prevention after A.S.D. Training	0.040	0.030	1.326	1.041
Vehicle Ownership Perception	-0.071	0.030	**-2.341**	**0.931***
Vehicle/Car Inspection	0.012	0.030	0.383	1.012
Traffic Risk Perception	0.062	0.030	**2.066**	**1.064***
Vehicle Fault Detection	-0.009	0.032	-0.316	0.991
Vehicle Prestige Gauging Perception	0.050	0.030	1.667	1.051
Vehicle use perception	0.041	0.030	1.367	1.042
Perception of application of traffic rules	-0.086	0.031	**-2.770**	**0.918***
Perception of traffic violation	0.033	0.031	1.065	1.034

**. Significant (z >1,96)*

The validity of these results depends on the provision of relevant assumptions. For this reason, firstly the residuals should be examined. It is necessary to draw a graph based on standardized residuals for the determination of outliers. Figure 1 shows the plot for the presence of outliers in the dataset. Residual values are other than ± 2 indicating the outliers. It is decided that there are outliers according to Figure 1.

When there are outliers in the data set, it is decided that a robust logistic regression analysis should be applied. The analysis results are given in Table 9. In robust regression analysis, in addition to the results of logistic regression analysis, advanced and safe driving training benefit perception, accident prevention after A.S.D. training, fear of traffic accident, vehicle prestige gauging perception and perception of traffic violation variables were found significant. The correct classification ratio of the robust logistic regression model is calculated as 78.2%.

As a result of the robust logistic regression analysis, the OR value for the perception of fear of traffic accidents was found to be 1.051. It was determined that this variable was a positively influential variable on advanced driving education.

This result shows that one unit increase in this variable value when the other variables are held constant raises the probability of receiving advanced driving training.

Figure 1. *Chart of Outliers*

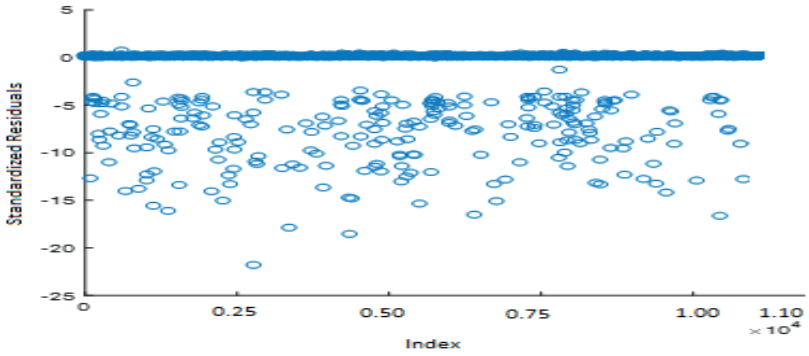

Table 9. *The Result of Robust Logistic Regression Analysis*

	$\hat{b}$	S.E.	z	Exp($\hat{b}$)
Constant	0.352	0.282	1.247	1.422
Gender	-0.099	0.085	-1.178	0.906
Age	-0.044	0.036	-1.244	0.957
Marital Status	0.070	0.080	0.869	1.073
Education	0.286	0.045	**6.353**	**1.331***
Profession	0.018	0.020	0.910	1.018
Traffic Rules Sanction	0.063	0.031	**2.032**	**1.065***
Fear of Traffic Accidents	0.005	0.020	**2.500**	**1.051***
A.S.D. Training Benefit Perception	0.068	0.030	**2.267**	**1.070***
Accident Prevention after A.S.D. Training	0.079	0.030	**2.633**	**1.082***
Vehicle Ownership Perception	-0.073	0.031	**-2.367**	**0.929***
Vehicle/Car Inspection	0.014	0.031	0.455	1.014
Traffic Risk Perception	0.061	0.031	**1.970**	**1.063***
Vehicle Fault Detection	-0.008	0.032	-0.262	0.992
Vehicle Prestige Gauging Perception	0.050	0.098	**1.964**	**1.051***
Vehicle use perception	0.043	0.031	1.387	1.044
Perception of application of traffic rules	0.063	0.031	**2.032**	**1.065***

**.Significiant (z >1,96)*

Conclusion

Education is the most important field for a nation to grow. Safety education plays a dynamic role in influencing the attitudes and behaviors of pedestrians and drivers. Road safety training plays a vital role in reducing traffic accidents. To minimize accidents caused by human error, it is necessary to measure the driver's traffic perception and put the knowledge of safe driving training into the drivers. The effectiveness of driver training programs in reducing traffic accidents has been the subject of much research. However, the training can be successful in proportion to the individual's desire to learn. In this study, factors affecting the traffic perception of the individuals tried to be determined for this purpose. After determining the factors affecting traffic perceptions, it was tried to determine what influenced the views on safe driving education. Logistic regression analysis was used to classify the views on the subject of advanced driving education. However, the use of the results of logistic regression analysis depends on the provision of the necessary assumptions. In our work, it was determined that there are outliers in the data set. In this case, it was seen that opinions on the subject of advanced driving training with the help of logistic regression analysis could not be correctly classified.

As a result of the logistic regression analysis, it was found that there was no meaning in the view of driving education on the view of driving education, traffic accidents, traffic violation perception, vehicle prestige perception, ASD perception after an accident, and advanced driving education benefit perception. However, when the effect of outliers is removed, it is determined that these variables are meaningful. It is quite reasonable that these variables affect the views on the issue of driving training. Also, according to the logistic regression analysis, the correct classification ratio was determined as 68.3% while the robust logistic regression analysis determined the correct classification ratio as 78.2%.

More research into the behaviors and crash experiences of drivers is needed to identify education-related factors. The role that driver education can play in augmenting within a graduated licensing system also examined. From these findings, it is seen that driving education should be taken to decrease the risky driving behaviors displayed in the traffic. It is, therefore, possible to increase traffic safety and reduce the number of accidents. Driving traffic perception can be taken into consideration for advanced driving training. The driving program addresses factors must have that to show associated with high collision rates.

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