

RESEARCHING EFFECTS OF DRIVERS FEATURES ON TRAFFIC ACCIDENTS: KOCAELİ MODEL

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ABSTRACT

In addition to environmental conditions, weather conditions and density, situations related to drivers are more effective on traffic accidents, according to available data.

Regarding occurrence of traffic accidents, it is observed that point of view of drivers towards traffic rules and drivers' compliance with these rules is not parallel. It is important to research the reasons that cause this situation. A normal person's mental state does not change without any reason at traffic. It is clear that these reasons may be significant factors that may change the attention of drivers or cause them make mistakes.

Within scope of this research, most of the traffic accidents that occurred in Kocaeli between 2006-2010 have been evaluated. Information registered by Ak Sigorta was used in this regard. Total 27.375 traffic accidents were addressed for the period between 2006-2010 and related tables were produced and these accidents were evaluated accordingly.

In addition, face-to-face surveys were conducted with 342 people who made accidents previously. These people were asked 22 questions on reasons of accidents and related results were evaluated with factor analysis.

It was understood that 91% of said accidents were made by male drivers. 49,8% of accidents were made by drivers at the age of 18-30, while 73,5% were made by people that have a profession, 55,98% were made by people with bachelor's degree and 58,42% were caused by the effect of other vehicles or people.

People who made accidents in the past were asked 22 questions and their answers were evaluated with factor analysis. Consequently, 4 main titles were produced as follows: 1. environmental effects and acting fecklessly, 2. Problem of confidence, 3. Education and personal features, 4. Insouciance.

Keywords: Traffic Accidents, Drivers, Researching Effects

INTRODUCTION

Traffic accidents cannot be prevented despite all efforts and measures. Significant works have been conducted to reduce number of traffic accidents for long years. Traffic accidents are particularly inevitable during periods of traffic density. Factors including long holiday terms, heavy rain and road situation have a big influence on increase of accidents. Yet, it is clear that driver is the most important factor among these factors that cause accidents.

Busy traffic, adverse weather conditions and improper road conditions cause accidents instead of changing point of view of drivers. Smooth traffic flow and appropriate road conditions are certainly desirable, but it is almost impossible that these are at optimum level. Local managements and state are responsible for eliminating these negative situations.

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Complying with traffic rules is the most important rule, which is the responsibility of drivers, not the state or local managements.

Traffic rules are international body of rules which are determined following long researches and which determine mode of action under any condition. It is true that accidents are minimized when traffic rules are complied.

I.OBJECTIVE OF THE RESEARCH

It may produce very important data to understand why drivers don't comply with traffic rules, and why they ignore, violate and disregard the same.

Purpose of this study is to investigate and evaluate the factors that cause drivers who made accidents to disregard or breach traffic rules, and to interpret the results.

With this study, it is intended to research the effects of following facts of drivers (who caused accidents in the past) on accidents, and to identify the extent of these effects.

- Gender
- Age
- Occupation
- Education level
- Other

The title 'other' covers situations which cause driver to make accident and which don't arise from driver himself.

II. BACKGROUND OF THE RESEARCH

Effects of drivers on traffic accidents, factors causing accidents, as well as connections between them have always been issues which are usually at top of the agenda by means of various studies. Analyzing related researches and the results obtained, following results appear as summary.

According to a study conducted at Ankara University for purpose of researching the factors that cause traffic accidents, human factor is the primary factor with a ratio of 96.6%. Ratio of vehicle factor is 0.05%, while effects of pedestrians on traffic accidents is in the second place with a ratio of 2.8%. On the other hand, main reasons of traffic accidents were listed as follows: insufficiency of highways considering number of vehicles, vehicle owners' being under heavy debt, driving sleeplessly and tiredly, use of alcohol, most of drivers' not being professional, insufficiency of traffic education and supervision (N.ÖZERKMEN, 2005).

With a study conducted at Dokuz Eylül University, it was intended to identify the factors which lead up to stress on driver behaviors that challenge the individuals at traffic. Factor analysis was conducted in order to identify collective relation of 24 variants that produce driver stress. 7 factors were obtained following the factor analysis. They are respectively: cross road stress, driving aggression, driving on difficult roads, adverse traffic conditions, prevention, taking risk and behaviors of other drivers (C.GÜRÇAY, İ.YÜKSEL, 2002).

Within scope of the study conducted at Süleyman Demirel University, effects of driver qualifications on traffic accidents were researched. Marital status, age, education and income level of drivers were taken into consideration. It was concluded that marital status was not associated with traffic accidents. In addition, it was also concluded that people below the age of 25 and above the age of 65 posed the highest danger. According to the study, people whose education level is secondary school and less involved in more accidents. The study revealed that the lower the income level is, the higher the rate of involvement in accidents (Ş.F. KALYONCUĞLU, 1999).

According to a study which researched stress-causing variants on driver behaviors, variants that were statistically effective on making accident, driving fast and drunk driving are: aggression caused by driving, feeling anxious in heavy traffic, being impatient during traffic intensity, being vigilant on difficult roads and wrong actions of other drivers (İ.YÜKSEL, 2002).

According to study conducted on 30.000 drivers, it was concluded that 4% of drivers made 40% of total accidents (Signori E, Bownian R G, 1974).

According to a study conducted on 422 drivers, significant gender difference was identified with regard to aggression, and stress on road. It is notable that drunk driving women were found to be more aggressive, anxious and made more accidents than men (Sinion F, Corbett C, 1996).

According to a study conducted with 5 factor personality test, it was concluded that dutiful, hardworking and honest people made less accidents, while it was identified that there is no relation between accidents and the concepts such as openness, being reconcilable, extroversion and neuroticism (Clark AW, 1976).

According to a study, no connection was identified between tendency to accidents and tendency to crime, realism, practicality and consistency. On the other hand, direct and strong connections were identified between extroversive, aggressive, sceptic, insecure and uncontrolled behaviors and tendency to accidents (Hilavaki L and others, 1989).

III. METHOD OF THE STUDY

In order to reduce the rate of future traffic accidents and to take necessary measures, it is quite important to identify major reasons that effect of driver mistakes arise from. If obtained results are precisely evaluated, it may be possible to minimize potential traffic accidents.

This research intends to evaluate most of the traffic accidents that occurred in Kocaeli between 2006-2010. In this regard, information registered at Ak Sigorta was utilized.

Total 27.375 traffic accidents were evaluated within scope of the study. Related tables were produced and evaluated. These tables are given below:

Table 1: Number of Traffic Accidents By Years

Years	Number of accidents
2006	4306
2007	4902
2008	5394
2009	6127
2010	6646

Table 2: Dispersion of Traffic Accidents by Gender

Year	Men	Women
2006	4127	179
2007	4508	394
2008	4921	473
2009	5481	646
2010	5897	749

Table 3: Dispersion of Traffic Accidents By Age

Year	Between 18-30	Between 31-45	Between 46-60	61 and above
2006	2193	1206	784	123
2007	2387	1312	897	306
2008	2538	1443	956	457
2009	3146	1538	1008	435
2010	3382	1714	1052	498

Table 4: Dispersion of Traffic Accidents by Occupation

Year	Doctor,lawyer, engineer,teacher, etc, (university graduate)	Businessmen	Self employed	Housewives	Unemployed
2006	3189	387	614	102	14
2007	3547	421	689	217	28
2008	3923	446	712	281	32
2009	4549	478	734	328	38
2010	4917	507	772	403	47

Table 5: Dispersion of Traffic Accidents by Education Level

Year	Primary school	Secondary school	High school	Associate degree	Bachelor's degree	Post graduate	Doctor's degree
2006	108	421	588	204	2883	94	8
2007	113	247	995	478	2914	141	14
2008	121	264	1086	732	3027	147	17
2009	137	292	1149	1143	3211	168	27
2010	141	312	1276	1417	3287	181	32

Table 6: Dispersion of Other Factors Regarding Traffic Accidents

Year	Weather conditions	Road conditions	Effect of other vehicles or persons
2006	775	904	2627
2007	931	1127	2844
2008	970	1186	3238
2009	1164	1409	3554
2010	1318	1598	3730

In parallel with this information, 342 drivers who made accident in Kocaeli in 2011 were asked questions on factors that caused the accident and potential factors that may cause accidents. Results are given in the following table. Evaluations in the survey are as follows: (1) Completely wrong, (2) Wrong, (3) Doubtful, (4) True, and (5) Completely true.

Item	Factors that cause accidents	1	2	3	4	5
1	Excessive speed					
2	Stress and distemper					
3	Negligence					
4	Alcohol					

5	Effect of education					
6	Effect of age					
7	Effect of gender					
8	Occupation					
9	Effect of other vehicles					
10	Road conditions					
11	Weather conditions					
12	Maintenance of vehicle					
13	Talking in the vehicle					
14	Excessive load or passenger					
15	Traffic intensity					
16	Lack of experience					
17	Obsessions					
18	Driving daringly					
19	Driving dreadingly					
20	Breach of rules					
21	Hurriedness					
22	Not having driving license					

ANALYSIS OF DATA

Considering 27.375 traffic accidents that occurred in Kocaeli city between the years 2006-2010, it was understood that 91% of these accidents were made by male drivers, while 9% of them were made by female drivers.

According to the dispersion of people that made accident by gender, it was observed that 91% of them were male drivers and 9% of them were female drivers (Graph 1).

Graph 1. Dispersion of Traffic Accidents by Gender

Gender	(ActualFrequencies)	(RelativeFrequencies)
Men	24934	%91
Women	2441	%9
Total	27375	%100

When dispersion of people that made accident by age group was analyzed, it was seen that 49,8% of them were at the age of 18-30, 26,4% of them were at 31-45, 17,2% of them were at 46-60 and 6,6% of them were at the age of 61 and over (Graph 2).

Graph 2. Dispersion of Traffic Accidents by Age

(Age Groups)	(ActualFrequencies)	(RelativeFrequencies)
Between 18-30	13646	%49,8
Between 31-45	7213	%26,4
Between 46-60	4697	%17,2
61 and above	1819	%6,6
Total	27375	%100

According to the dispersion of people that made accident by their occupational groups, it was understood that 73,5% of them were doctors, lawyers, engineers, teachers etc, while 8,2% of them were

businessmen, 12,8% of them were self-employed, 4,9% of them were housewives and 0,6% of them were unemployed (Graph 3).

Graph 3. Dispersion of Traffic Accidents by Occupation

(Job Groups)	(ActualFrequencies)	(RelativeFrequencies)
Doctor,lawyer,engineer,teacher, etc, (university graduate)	20125	%73,5
Businessmen	2239	%8,2
Self employed people	3521	%12,8
Housewives	1331	%4,9
Unemployed	159	%0,6
Total	27375	%100

Dispersion of people that made accident by education level showed that 2,26% of them were primary school graduates, 5,61% of them were secondary school graduates, 18,61% of them were high school graduates, 14,51% of them had associate’s degree, 55,98% had bachelor’s degree, 2,67% had post graduate degree and 0,36% of them had doctor’s degree (Graph 4).

Graph 4. Dispersion of Traffic Accidents by Education Level

Education Level	(ActualFrequencies)	(RelativeFrequencies)
Primary school	620	%2,26
Secondary school	1536	%5,61
High school	5094	%18,61
Associate’s degree	3974	%14,51
Bachelor’s degree	15322	%55,98
Post graduate	731	%2,67
Doctor’s degree	98	%0,36
Total	27375	%100

According to the dispersion of factors that cause accidents, it was concluded that 18,85% of them were caused by weather conditions, 22,73% of them were caused by road conditions and 58,42% of them were caused by the effect of other vehicles or persons (Graph 5).

Graph 5. Dispersions of Other Factors Regarding Traffic Accidents

Other factors	(ActualFrequencies)	(RelativeFrequencies)
Weather conditions	5158	%18,85
Road conditions	6224	%22,73
Effects of other vehicles or persons	15993	%58,42
Total	27375	%100

FACTOR ANALYSIS

Drivers who made accident in Kocaeli were given survey forms in order to identify the factors that cause accidents. Data obtained from 342 survey forms was subjected to factor analysis with SPSS 17 package program.

Within scope of the first step of factor analysis, KMO (Kaiser-Meyer-Olkin) and Barlet’s test was applied. Since Sig. Value was 0,00<0,05, it was concluded that the level of relation between the variants was sufficient to conduct factor analysis. When KMO value is higher than 0,80, it is considered that the variants are perfect for factor analysis. Since the value from KMO and Barlet’s test was 0,821, variants were perfect for factor analysis (Graph 6).

For the second step, Measures of Sampling Adequacy (MSA) value was checked and it was understood that all questions except for 14th question could be subject to factor analysis.

Within scope of the third step, ‘Total Variance Explained’ graph was checked and it was concluded that four questions of which eigenvalues were higher than ‘1’ were subject to factor analysis (Graph 7).

Graph 6: KMO (Kaiser-Meyer-Olkin) and Barlet’s test result

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,821
Bartlett's Test of Sphericity	Approx. Chi-Square	5139,498
	df	210
	Sig.	,000

Graph 7: Results of Variance Analysis

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8,464	40,303	40,303	8,464	40,303	40,303	6,670	31,761	31,761
2	2,330	11,096	51,399	2,330	11,096	51,399	2,482	11,817	43,577
3	1,450	6,905	58,304	1,450	6,905	58,304	2,309	10,995	54,572
4	1,364	6,495	64,799	1,364	6,495	64,799	2,148	10,227	64,799
5	,993	4,729	69,528						
6	,940	4,475	74,002						
7	,878	4,183	78,185						
8	,818	3,894	82,079						
9	,681	3,242	85,321						
10	,515	2,452	87,773						
11	,466	2,221	89,994						
12	,375	1,783	91,777						
13	,340	1,620	93,397						
14	,298	1,419	94,815						
15	,282	1,343	96,158						
16	,213	1,015	97,174						
17	,170	,809	97,983						
18	,132	,630	98,613						
19	,103	,489	99,102						
20	,099	,470	99,572						
21	,090	,428	100,000						

Extraction Method: Principal Component Analysis.

During the factor analysis, questions which remained under one factor, questions which dispersed to more than one factor, and questions of which values were below 0,50 were eliminated according to Rotated Component Matrix graph (Graph 8). In case a question takes similar values in different factor columns, it is eliminated from analysis. In addition, each of the factors must consist of minimum two questions.

Graph 8: Rotated Component Matrix

	Component			
	1	2	3	4
aşın hız	,863	,123	-,036	,218
alkol	,857	,223	-,070	,032
dikkatsizlik	,814	,179	-,180	,199
yol durumu	,792	,210	,041	,092
diğer araçların etkisi	,758	,357	-,005	,157
acelecilik	,719	,043	,165	,184
kural ihlali	,710	,406	-,006	,146
hava şartları	,695	,118	,169	,346
trafiğin yoğunluğu	,692	,418	,121	,090
tecrübesizlik	,677	,576	-,098	,102
stres ve gerginlik	,538	-,143	,008	,514
korkusuzca hareket	,413	,729	,076	-,005
korkarak hareket	,174	,618	-,217	,490
takıntılar	,307	,578	,151	,136
yaşın etkisi	,132	,065	,783	,035
cinsiyet	,131	,039	,773	-,192
meslek etkeni	-,289	,278	,717	,000
eğitimin eksikliği	-,013	-,255	,615	,093
araçta başka şeylerle ilgilenme	,019	,187	-,025	,791
ehliyetsiz olmak	,373	-,112	,079	,606
aracın bakımsızlığı	,212	,251	-,061	,520

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 10 iterations.

Four factors were determined following the factor analysis (Graph 9).

Graph 9. Questions Regarding Four Factors Determined Following the Factor Analysis

Questions of 1st factor: B1, B4, B3, B10, B9, B21, B20, B11, B15, B16, B2
 Questions of 2nd factor: B18, B19, B17
 Questions of 3rd factor: B6, B7, B8, B5
 Questions of 4th factor: B13, B22, B12

RELIABILITY ANALYSIS

Questions under four factors that were determined following the factor analysis were subject to reliability test individually. When Cronbach's Alpha values are 0,70 and higher, it is considered that the scale is reliable. Accordingly, it was concluded that the questions under four factors were reliable.

TESTING THE RELIABILITY OF QUESTION GROUPS IN FACTORS

Question groups were subjected to reliability test since Cronbach Alpha value of the first factor was 0,943, it was 0,801 for the second factor, 0,700 for the third factor and 0,565 for the fourth factor, and since reliability value of the questions under each of the factors was not higher than these Alpha values (graph 10).

Graph 10: Reliability value of questions under each of the factors

Case Processing Summary

		N	%
Cases	Valid	342	100,0
	Excluded ^a	0	,0
	Total	342	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,943	11

Case Processing Summary

		N	%
Cases	Valid	342	100,0
	Excluded ^a	0	,0
	Total	342	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,700	4

Case Processing Summary

		N	%
Cases	Valid	342	100,0
	Excluded ^a	0	,0
	Total	342	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,696	3

Case Processing Summary

		N	%
Cases	Valid	342	100,0
	Excluded ^a	0	,0
	Total	342	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,565	3

Four factors that cause students to start smoking, as well as questions under these factors and their values were identified according to the results of factor analysis. According to the content of questions gathered under the factor, 1st factor is 'environmental effects and driving fecklessly', 2nd factor is 'problem of confidence', 3rd factor is 'education and personal features' and 4th factor is 'Insouciance' (Graph 11).

Graph 11. Questions Under Factors, Factor Weights and Reliability Coefficients

Factor name	Questions	Factor weight	Cronbach's Alfa Reliability
1. Environmental effects and driving fecklessly	B1. Excessive speed B4. Alcohol B3. Negligence B10. Road conditions B9. Effect of other vehicles B21. Hurriedness B20. Breach of rules B11. Weather conditions B15. Traffic intensity B16. Lack of experience B2. Stress and distemper	0,863 0,857 0,814 0,792 0,758 0,719 0,710 0,695 0,692 0,677 0,538	0,943
2. Problem of confidence	B18. Driving daringly B19. Driving dreadingly B17. Obsessions	0,729 0,618 0,578	0,696
3. Education and features	B6. Effect of age B7. Effect of gender B8. Occupation B5. Effect of education	0,783 0,773 0,717 0,615	0,700
4. Insouciance	B13. Talking in vehicle B22. Not having driving license B12. Maintenance of vehicle	0,791 0,606 0,520	0,565

CONCLUSION AND RECOMMENDATIONS

Researching the effects of driver features on traffic accidents was based on two stages. Within scope of the first stage, 27.375 accidents that occurred in Kocaeli between 2006-2010 were investigated. It was revealed that 91% of accidents were made by male drivers. On the other hand, it

was understood that 49,8% of accidents were made by drivers at the age of 18-30, while 73,5% were made by people having a profession, 55,98% of them were made by people with bachelor's degree and 58,42% of them were caused by the effect of other persons or vehicles.

It is an important result that 76,2% of accidents were made by people at the age of 18-45, and that 73,52% of accidents were made by university graduates. Therefore it can be said that higher education does not have a positive effect on driver behaviors. Similarly, it is also important that rate of making accident centers on young people.

Considering the results obtained, it becomes necessary to give education which shapes driver behaviors during university term.

Within scope of the second stage, 22 questions that were asked to persons who made accident in the past were gathered under four main titles following the factor analysis. These four main titles are 1. Environmental effects and driving fecklessly, 2. Problem of confidence, 3. Education and personal features and 4. Insouciance respectively.

The factor that is named 'environmental effects and driving fecklessly' covers the majority of questions. Questions covered by this main title are; excessive speed, alcohol, negligence, road conditions, effect of other vehicles, hurriedness, breach of rules, weather conditions, traffic intensity, lack of experience, stress and distemper respectively.

When these two stages were evaluated together, among 23.375 accidents that were investigated in the first stage of the study, it was understood that 58,42% of accidents were caused by the effects of other vehicles or persons, while 22,73% of accidents were caused by road conditions and 18,85% of them were caused by weather conditions. It was observed that the factor named 'environmental effects and driving fecklessly', which was obtained following the survey that was conducted in second stage and which had the highest reliability value was in conflict with these results.

Consequently, it was understood that young people and university graduates are involved in more traffic accidents according to the data obtained from this research. Taking into account the factor named as 'environmental effects and driving fecklessly', it is clear that education on these reasons which cause accidents should be given from primary education to universities in particular.

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