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INFLUENCE OF ROAD SAFETY CULTURE ON DRIVERS BEHAVIOR BETWEEN GREECE AND PALESTINE

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Abstract: The aim of the paper is to investigate of differences in driving behavior between Greece and Palestine (West Bank Area) via applied of AUTH drivers' questionnaire (ADQ) on different categories of drivers through the analysis of exploratory factor analysis (EFA) based on the structure of four factors. Data were collected from the driver' participants randomly for each country to assess the diversity of drivers behavior and performance. The analysis stage included descriptive analysis, statistical tests, EFA, and logistic regression analysis. The study found that there was a difference in the distribution of the participants according to socio-demographic data and was statistically significant between their responses. The EFA results supported the distinction between the behaviors of drivers in both countries depending on the factors that emerged. The study suggested the names of the factors considering to the question groups, which included commitment of traffic rules and safe driver behavior, driving errors and ordinary violation, weather conditions and daytime, and essential supplies and financial status. The study concluded that road accidents are affecting due to the diversity of drivers' countries. In addition, the ADQ is appropriate to use and analysis of data according to the proposed set of factors and for evaluating the difference between countries in terms of driver behavior.

Keywords: driver questionnaire, factor analysis, driver behavior, safety culture, drivers' characteristics, traffic accidents.

1. Introduction

Every year the lives of approximately 1.35 million people are cut short as a result of a road traffic crash. Between 20 and 50 million more people suffer non-fatal injuries, with many incurring a disability as a result of their injury. Road traffic injuries cause considerable economic losses to individuals, their families, and to nations as a whole. These losses arise from the cost of treatment as well as lost productivity for those killed or disabled by their injuries and for family members who need to take time off work or school to care for the injured. Road traffic crashes cost most countries 3% of their gross domestic product (WHO, 2018). The analysis of driver behavior has been established as a critical part of preventing road crashes and improving road safety. While, it is established that the three main factors of a road crash are human factors (driver/road user behavior), road environment/design faults and vehicle faults, driver behavior

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has been determined as the critical reason for about 95 % of total road crashes (Singh, 2015). Another study indicated that the human factor is responsible for 85-90% of road accidents (Lewin, 1982; Rumar, 1985). Driving behavior comprises factors that have been found to contribute to road crashes. The road environment comprises several different elements which may in turn influence driving behavior differently. Numerous studies have been conducted worldwide to examine specific risky behavior of drivers which can be directly related to the occurrence of traffic accidents (Dingus *et al.,* 2016; Hamdar *et al.,* 2016).

Human factors in driving can be seen as being composed of two separate components, driving skills and driving style. Driving skills include those information processing and motor skills, which improve with practice and training (driving experience). Driving style concerns individual driving habits which become established over a period of years but it does not necessarily get safer with driving experience (Elander *et al.,* 1993). In particular, driving behavior is associated with driving style. Driver behavior is a very complex matter that is influenced by one's knowledge, abilities, and skills on the one hand and personality traits (such as volition, values, and motives) on the other (Sucha *et al.,* 2014). Driver behavior is a key factor in crash risk. Risky driving attitude terminology is used to explain behavior, which directly increase accident risk, such as over speeding or violation of traffic rules while driving and attitudes related to traffic safety (Yilmaz *et al.,* 2011). Drivers often engage in behavior that poses a risk to both themselves and to other road users. While many of these unsafe actions are active, conscious rule violations, others are the result of errors due to inexperience, momentary mistakes or inattention. Intentional or not, both rule violations and deficiencies in memory, judgment, or situational awareness can and do contribute to traffic collisions (Stanton & Salmon, 2009; Cordazzo *et al.,* 2014). Drivers with high risky driving behavior have more exposure to traffic violations and accidents. Distraction is a contributory cause for drivers to cause traffic accidents which includes nontechnology-based activities such as eating, drinking, smoking, and talking with passengers, as well as technology-based activities; such as using of mobile phone while driving and the use of visual displays (WHO, 2011).

Based on Reason's extensive work on the human contribution to disaster across a wide range of situations, the Driver Behavior Questionnaire (DBQ) was designed as a self-report measure of the behavior that may increase the risk of crash involvement (Reason *et al.,* 1990). Reason *et al.* (1990) found that driving errors and violations are two types of behavior containing three factors: violations, errors and slips/lapses. For more than two decades, there are identified almost 200 studies that have used the DBQ in part or in its entirety (Parker *et al.,* 1995; Iversen & Rundmo, 2002; Machin & Sankey, 2008; de Winter & Dodou, 2010; Cordazzo *et al.,* 2014) (it has been applied in numerous countries as United Kingdom, USA, China, Australia, Sweden, Greece, Netherlands, Spain, France, New Zealand, Turkey, Qatar and United Arab Emirates). However, the factorial structures of the DBQ, as well as the number of items vary between different driving cultures and nations (Martinussen *et al.,* 2013). The original DBQ contained 50 items that loaded onto three descriptive factors: driving violations, driver error and attentional lapses (Reason *et al.,* 1990). Along with the

taxonomy development, several different versions of the DBQ appeared, varying the number of factors (2 to 6) (Lajunen *et al.,* 2004; Ozkan *et al.,* 2006). In Australia, Blockey and Hartley (1995) found a three-factor solution: general errors, dangerous errors and violations (Sarbescu, 2013). In Sweden, Aberg and Rimmo (1998) identified two different types of errors: inattention and inexperience errors. In China, Xie and Parker (2002) obtained a slightly different four-factor structure: lapses and errors, inattention errors, aggressive violations and maintaining progress violations. Also, Lajunen *et al.* (2004) have argued for the cross-cultural stability of the classic four-factor structure of the DBQ (errors, lapses, "ordinary" and aggressive violations), in Britain, Finland and The Netherlands. In Romania, a 37 items version has been validated and it was found a three-factor solution (errors, dangerous violations and speeding violations) to be the most interpretable one (Havarneanu *et al.,* 2010). However, the cross-cultural version of the DBQ hasn't yet been used (Sarbescu, 2013). In addition to the content of the factors, the number of factors varies between the studies, where some of the studies have more and fewer numbers of factors compared to the original DBQ. Despite cross-cultural differences, the significant distinction between unintended errors and intended violations has been found in most of the studies (Hennessy & Wiesenthal, 2005; Martinussen *et al.,* 2013).

The DBQ model was created at a time when some of modern technologies were not used or were widespread such as the use of GPS navigation maps, mobile phones and others. Therefore, there is a need to create a new integrated and modern model, which contains the attitude of drivers and evaluates their behavior while driving due to the diversity of questions. This is why a new model, called AUTH questionnaire for assessing driver behavior (ADQ) is being published. The aim of this study is to assess the impact of countries' difference on driver behaviors between in Greece and Palestine (West Bank) by applied a four-factor ADQ. In particular, the distinction between errors and violations in the driver sample for both countries is investigated. The comparison between them in terms of driver behaviors has been analyzed as a difference between them in many aspects, the most important of which are culture, traffic regulations, road infrastructure, economic situation, etc. Using data from more than 830 participants from two countries and through the use of a four-factor exploratory factor analysis (EFA), diversity in driver behavior and performance was assessed. In addition, this is what distinguishes this study from the previous one, in which the data were analyzed via EFA, but the estimated number of factors was dependent on a method of the Kaiser criterion of eigenvalues over 1.0, the Cattell Scree plot, parallel analysis and the interpretation of factors.

2. Methodology

The study included several stages to complete the research as follows.

2.1. AUTH Driver Questionnaire (ADQ)

The questionnaire form was prepared for online distribution and included various aspects of driver behavior. It consists of two main parts; the first section includes driver's socio-demographic information on gender, age category, level of education, marital status, disability, glasses wear and road accidents with or without injury. The second

section consists of 50 elements designed to measure general violations, omissions, errors and their commitments to meet traffic safety. The ADQ is available in Greek and Arabic languages used in Greece and Palestine respectively. In addition, it is available in English for use in any country.

2.2. Participants, Sampling Procedure and Data Collection

The questionnaire was distributed randomly online by sending the questionnaire link via email and social media such as Facebook, WhatsApp and Viber. In addition, it was sent and notified to different categories of drivers in Greece and Palestine. The data of the completed questionnaires included the answers of 830 respondents that were collected online for each country. Where, the first part records the socio-demographic data of the respondents and included eight different questions; four questions for personal information and another four questions answered on a dichotomous scale yes or no. The survey questionnaire consists of closed-ended questions and the majority of answers are measured using a five-point of Likert scale which included the choices of always, very often, sometimes, rarely and never. Respondents were asked to state how often they committed any driving violations and mistakes.

2.3. Analysis of Data

Data analyzes were performed using the software of Statistical Package for Social Sciences (SPSS) for data analysis (Stephens & Fitzharris, 2016; Maslac *et al.,* 2018; Sucha *et al.,* 2014; Maslac *et al.,* 2017). The ADQ data analysis included descriptive analysis, statistical tests, exploratory factor analysis (EFA), and logistic regression analysis, which applied for data collection of 830 driver participants in Greece and Palestine.

2.3.1. Descriptive Analysis

Participants were asked through ADQ to state their socio-demographic information such as age, gender, marital status, educational level, etc. Moreover, the questions related to driver behaviors and many other questions. The descriptive analysis includes the display of the collected driver distribution data and the comparison between the responses of the ADQ participants in both countries. In addition, the mean and standard deviation of participants' answers to the questions were assessed (Martinussen *et al.,* 2013; Stephens and Fitzharris, 2016; Bener *et al.,* 2008; Stanojevic *et al.,* 2018; De Campos *et al.,* 2020; Dabirinejad *et al.,* 2020; Al Matawaha *et al.,* 2020).

2.3.2. Statistical Tests

This part of the analysis included of chi-square test that applied for independent and varied evaluation between participants in Greece and Palestine in terms of different driver characteristics. In addition to one-way analysis of variance (ANOVA) used to assess whether, there are significant differences between the drivers that responded in both countries (Bener *et al.,* 2008; Stanojevic *et al.,* 2018).

2.3.3. Exploratory Factor Analysis

Exploratory factor analysis provides a factor structure, a grouping of variables based on strong correlations (Dabirinejad *et al.,* 2020; Haig, 2010; De Campos *et al.,* 2020; Yong & Pearce, 2013). Various methods have been proposed to determine the number of factors. Most of studies have been involved

the factors whose eigenvalues are less than one, as they provide less information than those provided by a single variable and according to the scree plot, which is probably the most popular method for determining the number of factors, but is subjective, forcing different people to analyze the same data with different results. The varimax rotation is the most popular orthogonal rotation technique (Costello & Osborne, 2005). EFA with Varimax rotation applies to the study as a first step in identifying the main variables. This branch of analysis applies to driver performance and driver behaviors in order to investigate which observed variables are most correlated with the common factors and how many common factors are needed to give an adequate description of the data (Papantoniou, 2015). The EFA result is done through many steps and equations using data analysis; where, the study depends on SPSS for EFA (Hintze, 2007).

The criteria used to determine the number of factors were the Kaiser criterion of eigenvalues over 1.0, the Cattell Scree plot, parallel analysis and the interpretability of the factors. Initially, eleven and eight factors had eigenvalues over 1.0 in Greece and Palestine respectively. However, the Scree plot and parallel analysis showed that the four-factor solution to be the most interpretable for comparison between the two countries (Bener *et al.,* 2008; Stanojevic *et al.,* 2018). Thus, through this part of the analysis, EFA applied to acquire a four-factor structure for Greece and Palestine. The case of Greece was adopted as a point of reference for comparison with the case of Palestine.

2.3.4. Logistic Regression Analysis

Applying logistics regression analysis, the study included evaluating the effects of different drivers' behavior on road safety. The model includes the characteristics of drivers and their information in addition to the four factors. Through the logistic model, the relationship between the factors, variables and the involvement of a car accident is clarified (Bener *et al.,* 2008; Karacasu *et al.,* 2014).

3. Results of Analysis

3.1. Socio-demographic Characteristics of the Surveyed Drivers

Table 1 presents the main characteristics of research sample, considering the distribution of participants according to characteristics between the two countries.

Table 1
The Distribution of Demographic Variables for Greece and Palestine

Variables		Country				df	p
		Greece		Palestine			
		No. of Drivers	% of Drivers	No. of Drivers	% of Drivers		
Gender	Male	449	54.10	488	58.80	1	0.054
	Female	381	45.90	342	41.20		
Age Category	-17	13	1.57	31	3.73	4	0.000
	18-35	280	33.73	325	39.16		
	36-49	251	30.24	320	38.55		
	50-64	218	26.27	116	13.98		
	65+	68	8.19	38	4.58		
Education Level	No Education	17	2.05	38	4.58	4	0.000
	Secondary School	151	18.19	119	14.34		
	Bachelor Degree	544	65.54	487	58.67		
	Master Degree	92	11.08	149	17.95		
	PhD Degree	26	3.13	37	4.46		
Marital Status	Unmarried	254	30.60	187	22.53	4	0.000
	Married	360	43.37	526	63.37		
	Divorced	31	3.73	58	6.99		
	widow	15	1.81	39	4.70		
	Other	170	20.48	20	2.41		
Disability	Yes	33	3.98	22	2.65	1	0.131
	No	797	96.02	808	97.35		
Wearing Glasses	Yes	199	23.98	143	17.23	1	0.001
	No	631	76.02	687	82.77		
Had Traffic Accident	Yes	216	26.02	201	24.22	1	0.396
	No	614	73.98	629	75.78		

The study noted that there is a variation in values in the characteristics of participants between the both countries. However, there is a similarity between the two countries in terms of the higher percentage of the characteristic participants. Male drivers, age category of 18-35, degree holders, married, healthy drivers, drivers who did not wear glasses and had no road accidents have the highest percentage in Greece and Palestine.

A chi-square test showed that significant differences were found between Greece and Palestine in the age of drivers, the level of education, marital status and glasses wear, at level ($p < 0.05$).

3.2. Drivers' Response of ADQ

Based on the mean and standard deviation values obtained through the descriptive analysis of the drivers' responses to the questionnaire in both countries, as shown in Table 2; there are differences in the resulting values that indicate that there is variation in attitude and behaviors between

the drivers in Greece and Palestine. By testing the statistical significance of the differences in responses between drivers in Greece and Palestine and applying an ANOVA statistical test, the impact of country diversity on drivers' behaviors through their ADQ respondents is assessed as shown in Table 2.

Table 2

The Statistical Test of ANOVA between Questionnaire Items and Countries

Item No.	Item	Greece		Palestine		F	p
		Mean	SD	Mean	SD		
Q1	I comply the instructions and regulations of traffic	1.53	0.811	1.48	0.711	1.576	0.210
Q2	I haven't committed a traffic violation in before which is punished by law	1.92	0.875	1.72	0.763	24.037	0.000 ***
Q3	I give the priority and open the way for emergency vehicles such as police, ambulance, civil defense, etc.	1.16	0.693	1.37	0.689	38.651	0.000 ***
Q4	Watching the traffic and warning signs on the road increase my attention while driving	1.61	0.838	1.69	0.737	4.476	0.035 *
Q5	knowing that there is traffic control including intelligent surveillance improve my behavior and my commitment to traffic instruction while driving	1.9	0.874	1.61	0.79	50.029	0.000 ***
Q6	I think that increasing the traffic awareness of drivers through audio and visual means will reduce the violation of traffic laws, traffic accidents and achieves the required traffic safety	1.85	0.893	1.88	0.752	0.598	0.440
Q7	I park the vehicle in suitable places which permitted by law	1.81	0.858	1.7	0.673	8.387	0.004 **
Q8	I use seat belt while driving	1.31	0.704	1.8	0.801	177.134	0.000 ***
Q9	I make sure that all passengers fastening the seat belts before beginning of trip	1.58	0.835	2.21	0.952	202.417	0.000 ***
Q10	I prefer driving a vehicle on the road during the daytime rather than driving at night-time	2.79	0.948	2.18	0.863	186.313	0.000 ***
Q11	I prefer driving the vehicle during the daytime because the vision is better for other vehicles and surrounding environment	2.74	1.146	2.06	0.926	177.184	0.000 ***
Q12	I prefer driving the vehicle in the lighted roads at evening time than the roads that are not lit, considering that they are furnished with lines, marks and reflectors required	2.52	1.029	2.09	0.824	86.459	0.000 ***
Q13	I prefer driving the vehicle on the road during good weather conditions with clear visibility comparison to other weather conditions	1.88	0.999	2.02	0.98	9.004	0.003 **
Q14	The bad weather conditions and the resulting blurred vision or risk of slippage, for example, affect my performance positively when I drive a vehicle on the road, such as increasing attention, reducing speed, and not violating traffic laws	1.97	0.978	2.05	0.98	2.906	0.088
Q15	The bad weather conditions reduce my overall use of the vehicle on the road	3.16	1.018	3.25	0.868	3.588	0.058
Q16	The temperature rising through summer season is increasing my tiredness, fatigue and reduce attention while driving a vehicle on the road	3.09	0.969	2.99	0.761	5.604	0.018 *
Q17	The system of cooling and heating effects on me positively while driving the vehicle	2.44	1.04	2.36	0.9	2.776	0.096
Q18	I maintain a clear vision during driving by taking care of the cleanliness of the glass	1.63	0.896	1.64	0.778	.069	0.792

Item No.	Item	Greece		Palestine		F	p
		Mean	SD	Mean	SD		
Q19	I don't drive the vehicle on the road while I am under the influence of alcohol or narcotic drugs that were prevented to take during driving	1.41	0.792	1.36	0.784	1.552	0.213
Q20	I drive the vehicle on the road while feeling tired, drowsy or sick	4.09	0.86	3.63	0.949	103.907	0.000 ***
Q21	I drive the vehicle on the road while feeling angry or challenging others	3.88	0.91	3.43	0.904	102.936	0.000 ***
Q22	I don't take regular breaks while driving long distances	3.91	0.956	3.4	0.895	123.955	0.000 ***
Q23	I take stimulants that help you wake up while driving when feeling tired especially when driving for long distances	4.33	0.917	3.85	1.078	95.753	0.000 ***
Q24	The traffic jam is affecting on my behavior during driving, such as feeling angry or tired, etc.	3	0.967	2.73	0.766	40.084	0.000
Q25	I talk by cell phone while driving a vehicle on the road	3.76	0.865	2.55	0.917	758.104	0.000 ***
Q26	I use the Internet via a Smartphone, such as texting and reading messages, social networking applications, browsing and watching the screen while driving a vehicle on the road	4.08	0.907	3.57	0.92	128.570	0.000 ***
Q27	I use alternatives of phone device while driving such as a Bluetooth headset or speaker in the vehicle	3.61	1.238	2.47	0.897	461.555	0.000 ***
Q28	I think that using smart applications to identify road and locations improves your performance and behavior while driving on the road	2.29	1.097	2.45	0.843	10.642	0.001 **
Q29	I reduce the speed of the vehicle to appropriate speed when approaching specific areas such as intersections, curves and slopes, etc. on the roads	1.48	0.778	1.35	0.679	14.433	0.000 ***
Q30	I decrease the speed of vehicle and stop when approaching the pedestrian crossing areas	1.39	0.784	1.46	0.76	3.764	0.053
Q31	I commit to the appropriate speed required while driving on the roads whether or not there are signs for speed limit	1.83	0.913	1.67	0.767	16.143	0.000 ***
Q32	I cross the intersection of a light signal in the case of yellow light while driving the vehicle	3.99	0.982	3.95	0.888	0.749	0.387
Q33	The delay in getting the desired place or urgency for any reason motivate you to increase speed or violate some traffic laws to reduce the time to reach	4.24	0.848	3.68	0.945	160.326	0.000 ***
Q34	I reduce vehicle speed when approaching bumps on roads	1.8	0.926	1.62	0.764	18.315	0.000 ***
Q35	I inspect daily my vehicle, such as water, oil engine and tires, etc., before driving the vehicle	2.54	0.91	2.21	0.786	61.637	0.000 ***
Q36	I don't drive the vehicle which has a mechanical failure that may cause the vehicle to stop or not to be controlled	1.53	0.83	1.63	0.831	5.591	0.018 *
Q37	I check regularly and repair the vehicle in a timely manner without delay it	1.91	0.875	1.79	0.742	8.971	0.003 **
Q38	I eat and drink while driving a vehicle on the road	3.92	0.917	3.28	0.843	218.237	0.000 ***
Q39	I talk and engage with passengers while driving a vehicle on the road	2.88	0.887	2.75	0.726	10.307	0.001 **
Q40	I smoke while driving a vehicle on the road	4.19	1.032	3.72	1.318	65.390	0.000 ***
Q41	The existence of announcements of all kinds besides the roads, is affecting on my attention and distract my concentration while driving the vehicle	3.48	0.967	3.36	0.961	6.612	0.010 *
Q42	I observe the screen that shows the speed of the vehicle, engine information, fault codes, etc.	1.42	0.723	2.36	0.834	602.636	0.000 ***
Q43	I drive on the off-road, not paved or unsafe to reach the required location	4.35	0.877	3.64	0.83	285.481	0.000 ***

Item No.	Item	Greece		Palestine		F	p
		Mean	SD	Mean	SD		
Q44	I specify the route that you will take and estimate the expected time of trip to get the required location before start driving of vehicle	2.19	0.925	2.45	0.82	36.773	0.000 ***
Q45	I make sure that the first-aid kit is available in my vehicle	2.04	0.984	2.29	1.061	24.426	0.000 ***
Q46	I take care of the presence of emergency supplies in the vehicle such as fire extinguisher, equipment for changing the wheels and the searchlight for lighting in the dark, etc.	1.6	0.87	1.86	0.966	33.562	0.000 ***
Q47	I prefer the system of participation with other vehicles or using public transport more than using of the private car for economic saving	3.36	0.968	3.76	1.083	64.464	0.000 ***
Q48	I prefer driving the vehicle which has less fuel consumption such as Hybrid Cars that are less impactful for environmental pollution	2.5	1.08	2.52	1.09	0.205	0.651
Q49	I check and estimate the amount of fuel available in the vehicle and its adequacy to be used before starting the journey and arriving required location	1.69	0.908	1.81	0.884	8.432	0.004 **
Q50	The low income and economic crises affect and reduce of using my vehicle in mobility	2.93	1.053	3.34	0.976	68.382	0.000 ***

Where: * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

The study found that there is a statistical significance of most questions in statistically significant ($p < 0.05$), ($p < 0.01$) and ($p < 0.001$) as shown in Table 2. This means that some questions have different answers and others have similar answers between drivers in Greece and Palestine.

3.3. Exploratory Factor Analysis for ADQ

Depending on the values of Table 3, the exploratory factor analysis proceeded a four-component solution with Varimax rotation of ADQ in Greece and Palestine.

Table 3

EFA Results of Four Factors of ADQ for Greece and Palestine

Rotated Component Matrix								
Item	Greece				Palestine			
	Number of Factor				Number of Factor			
	1	2	3	4	1	2	3	4
Q3	0.866				0.628			0.497
Q30	0.808				0.403			0.693
Q29	0.771				0.572			0.565
Q1	0.768				0.433			0.604
Q8	0.766				0.358			0.613
Q4	0.747				0.487			0.639
Q18	0.71				0.764			0.326
Q19	0.706				0.491			0.457
Q7	0.695				0.375			0.645
Q6	0.659				0.267			0.65
Q5	0.645				0.609			0.482
Q9	0.627				0.415			0.47

Rotated Component Matrix								
Item	Greece				Palestine			
	Number of Factor				Number of Factor			
	1	2	3	4	1	2	3	4
Q31	0.622							0.665
Q36	0.606				0.396	-0.427		0.291
Q34	0.599				0.616			
Q49	0.585				0.634			
Q37	0.529				0.508			
Q46	0.516				0.338			0.577
Q43	-0.503					0.607		
Q14	0.459				0.844			
Q23	-0.447				0.39		0.445	
Q44	0.409				0.534			
Q2	0.401				0.45			
Q42	0.379				0.546			
Q17	0.3				0.799			
Q22	-0.29							-0.645
Q25		0.767					0.793	
Q27		0.738					0.57	
Q26		0.667				0.442	0.482	
Q38		0.544				0.543	0.309	
Q39		0.512					0.506	
Q20		0.503			-0.654	0.476		
Q21		0.5				0.636		
Q28		0.465						0.666
Q24		0.46				0.365		
Q33		0.437				0.52		-0.252
Q32		0.385				0.311		-0.586
Q41		0.373				0.508		
Q40		0.359					0.39	-0.261
Q11			0.832		0.822			
Q10			0.813		0.738			
Q12			0.771		0.78			
Q15			0.684				-0.379	
Q13			0.515		0.87			
Q16			0.442		0.35			0.331
Q47				0.673		0.588		
Q48				0.668	0.538			
Q50				0.624		0.625	-0.305	
Q45				0.535				0.396
Q35				0.381				0.678
Cronbach's alphah	0.886	0.82	0.833	0.647	0.923	0.621	0.454	0.8
Eigenvalues	14.816	3.341	2.542	2.313	16.059	3.204	2.47	4.37
Variance (%)	22.884	9.535	7.975	5.634	22.073	8.105	5.835	16.193
Total Variance (%)	46.027				52.205			

The study found that there is a difference in the distribution of the loading factor values as a result of the questionnaire data. The case of Greece was proposed as a reference for comparison with Palestine and it was noted that there are some questions that share the same factors between the two countries. The study suggested the names of the factors as follows: 1. Commitment to traffic rules and "safe driver" behavior; 2. Driving errors and routine violation; 3. Weather conditions and daytime; and 4. Basic supplies and financial status.

From the EFA and depending on most studies that have implemented DBQ, there are some emerging values that indicate the success of the questionnaire application; mainly include of factor estimation, explanation of the total variance and the loading values of the factors that are accepted at minimum values of 0.30. In addition, Cronbach's Alpha factor values are estimated to examine the reliability of the questioner for each factor in order to determine the internal consistency where the minimum value to be accepted is 0.50. Values of factor loads resulting from the EFA below 0.30 are omitted and, accepting minimum values of 0.30 and above. Exception in some cases when the subject matter is considered important, some studies allow approval (Bener *et al.,* 2008; Martinussen *et al.,* 2013; Stephens and Fitzharris, 2016; Cordazzo *et al.,* 2014; Stanojevic *et al.,* 2018; Ulleberg and Rundmo, 2003; Maslac *et al.,* 2017; Maslac *et al.,* 2018; Yilmaz *et al.,* 2006; Davey *et al.,* 2007).

Through EFA, the stability of the data sample for factor analysis from KMO and Bartlett's test in both countries were assessed. It was found that there is a high correlation between the variables depending on the resulting values of Kaiser-Meyer-Olkin=0.938 and 0.947 for Greece and Palestine respectively. Moreover, the sig. of Bartlett's Test=0.000 for both countries. For case study of Greece, he found all the data that contained acceptable values and higher than 0.3 except the question Q22 which has value of 0.29 and less than the value of 0.3. However, it is possible to accept the price of Q22 because it is important (Cordazzo *et al.,* 2014). Whereas, in the case study of Palestinian study, it found that all values of loading coefficients are acceptable, where all are higher than 0.3.

Regarding the resulting Cronbach's alphah values, it was observed that all the factor values in the case of Greece are acceptable. While, for the case of Palestine, a value less than 0.5 was found in factor 3 (third column); where, was 0.454. Regarding the values of eigenvalues, it was found that there is a variation and all factors have values more than one in Greece and Palestine. In terms of fluctuation values (%) for the factors are acceptable and found a variety of values in both countries. While the total of variance (%) is explained by the values of 46.03 and 52.21 for Greece and Palestine respectively (Reason *et al.,* 1990; Blockey & Hartley, 1995; Cordazzo *et al.,* 2014; Stanojevic *et al.,* 2018). Considering to the EFA results in both countries, all factors are reliable and there is a good internal consistency among f the questionnaire data. Thus, the ADQ implemented in Greece and Palestine is successful and acceptable.

Looking at the EFA results on distribution, the loading values of questionnaire items on the factors and based on the adoption of Greek case as a reference for the four-factor structure, it is considered to the loading data of the Palestinian case after classification

and distribution based on the distribution of Greek data for each factor, as showing in Table 3. The study found that there is a difference in the distribution of the items depending on the factors between the two countries.

3.4. Logistic Regression Analysis

Considering to the results obtained previously, there is a variation in road accidents based on the different characteristics of drivers and the countries to which they belong. The study applied the regression analysis to predict the indications that contribute to road accidents caused by drivers in Greece and Palestine, as shown in Table 4 and Table 5 respectively. The analysis depends on the variety of driver variables including gender, age, level of education, marital status, disability, and glasses wear. In addition to the four factors that include the commitment of traffic rules and positive behaviors, errors and ordinary violation, weather conditions and daytime, and basic supplies and financial status.

3.4.1. Case Study of Greece

A test of the complete model from Omnibus tests of model coefficients with all predictors factors versus a single fixed model, was statistically significant, where the resulting Chi-square value is ($X^2_{10,830}=78.299$, $p<0.001$), indicating that the set of the predictors showed a significant difference between drivers with accidents and without accidents. In addition, the results values of Log likelihood, Cox & Snell R Square, and Nagelkerke R Square are 873.394, 0.090 and 0.132 respectively. In addition, the variation in road accident involvement was 20.40% with a total of 75.8 % of drivers being correctly classified.

Table 4

Logistic Analysis of Traffic Accidents Involvement of Drivers' Behavior for Case Study of Greece

Variable	B	Wald	Odds Ratio	95% Confidence Interval for Odds Ratio	
				Lower	Upper
Gender	-0.373-	4.246	0.689	0.483	0.982
Age	0.227	5.796	1.255	1.043	1.509
Education	0.124	1.088	1.132	0.897	1.427
Marital Status	0.027	0.204	1.028	0.913	1.156
Disability	-0.023-	0.003	0.978	0.44	2.174
Wearing Glasses	-1.020-	30.518	0.361	0.251	0.518
Factor-1: Commitment of Traffic Rules and "safe driver" Behavior	-0.057-	0.377	0.944	0.787	1.134
Factor-2: Errors and Ordinary Violation	-0.139-	2.382	0.871	0.73	1.038
Factor-3: Weather Conditions and Daytime	-0.319-	11.81	0.727	0.606	0.872
Factor-4: Essential Supplies and Financial Status	0.028	0.105	1.029	0.867	1.22
Constant	0.11	0.013	1.116		

As shown in Table 4, it is noted that there is a variety of values that result from the logistic analysis of the various variables which are including of drivers' properties and factors. This indicates that the variability of some variables has a greater impact on the resulting traffic accidents than the others of variables. Considering the variables of driver characteristics and information, the highest value of the odds ratio was at the age of drivers 1.255; followed by education, marital status, disability, gender, and glasses wear. Furthermore, it is indication that the age change affects road accidents more than others. Moreover, the odds ratio of wearing driver glasses had the lowest value 0.361 and is an indication that the difference between drivers wearing glasses or not is the smallest impact of the difference in the resulting traffic accidents. In addition, the factor-4 odds ratio is 1.029 showed a relatively large change in the likelihood of traffic accident involvement based on a change in factor-4. While, the probability of getting involved in traffic accidents is lower for the factors of factor-1, factor-2 and factor-3 are 0.944, 0.871 and 0.727 respectively.

3.4.2. Case Study of Palestine

A test of the complete model by Omnibus tests of model coefficients with all predictors versus a single fixed model was statistically significant, where the resulting Chi-square value is ($X^2_{10,830}=46.873$, $p<0.001$), indicating that the set of the predictors showed a significant difference between drivers with accidents and without accidents. Moreover, the results values of Log likelihood, Cox & Snell R Square, and Nagelkerke R Square are 872.048, 0.055 and 0.082 respectively. In addition, the variance in traffic accident involvement was 7.0% with an overall rate of 76.6% of drivers registered correctly.

Table 5

Logistic Analysis of Traffic Accidents Involvement of Drivers' Behavior for Case Study of Palestine

Variable	B	Wald	Odds Ratio	95% Confidence Interval for Odds Ratio	
				Lower	Upper
Gender	-0.28	2.504	0.755	0.534	1.069
Age	0.238	5.198	1.269	1.034	1.557
Education	-0.098	0.77	0.906	0.727	1.129
Marital Status	0.126	1.412	1.134	0.922	1.395
Disability	-0.713	2.47	0.49	0.201	1.193
Wearing Glasses	0.034	0.022	1.035	0.661	1.618
Factor-1: Commitment of Traffic Rules and Positive Behavior	0.05	0.287	1.051	0.876	1.262
Factor-2: Errors and Ordinary Violation	-0.069	0.655	0.934	0.79	1.103
Factor-3: Weather Conditions and Daytime	0.404	20.955	1.498	1.26	1.781
Factor-4: Essential Supplies and financial Status	-0.166	2.846	0.847	0.699	1.027
Constant	-0.092	0.007	0.912		

As showing Table 5, it is found that there is a variety of values that result from the logistic analysis of the various variables that include the properties and factors of the drivers. This indicates that the variability of some variables has a greater impact on the resulting traffic accidents than the other variables. According to the drivers' characteristics and information variables, the highest value of the odds ratio was at the age of drivers 1.269; followed by marital status, glasses wear, education, gender and disability. It is an indication that age change has a greater impact on traffic accidents than the others. In addition, the driver disability ratio had a lower value 0.490 and is an indication that the difference between drivers with a disability or not is the smallest impact on the difference in accidents. In addition, the factor-3 odds ratio is 1.498 which showed a relatively large change in the probability of traffic accident involvement based on a change of unit in the factor-3. While, the probability of getting involved in traffic accidents is lower for the factors of factor-1, factor-2 and factor-4 are 1.051, 0.934 and 0.847 respectively.

4. Discussion

The aim of this paper is to investigate the differences in driving behavior between Greece and Palestine through the ADQ application. This questionnaire was randomly distributed to different categories of drivers and the data were obtained from 830 of participants in each country. The EFA results supported the distinction between the two countries in terms of four factors relating to traffic commitment and "safe driver" behavior, driving errors and common violations, weather conditions and daytime and basic supplies and financial status.

Reason *et al.* (1990) developed of DBQ and Parker *et al.* (1995) refined it, in order to investigate the extremely complex driving behavior. The classification of behavioral items in the (DBQ) is based on Reasons theory, specifically in the "generic error modelling system" (GEMS). Although this type of questionnaire contains behaviors that are normally too private to be detected by direct observations, drivers rate the risk-elevating behaviors committed while driving of driving experience. Its original purpose was to determine whether the distinction between errors and violations would occur, due to the belief that these two types of behaviors have psychologically distinct origins, and thus require separate remedial techniques. Driving behavior can be assumed to reflect socio-economic differences in traffic safety. Ozkan *et al.* (2006) in their study, show that drivers in Western/Northern European countries scored higher on common violations while drivers in Southern/Middle Eastern European countries had higher scores on driving errors and aggressive driving. The concept of being a "safe driver" depends on safety culture and the state of road infrastructure in different countries. Due to age, gender, socio-economic and cross-cultural differences, the significant distinction was found between unintentional errors and intentional violations/non-binding traffic rules. In particular, the errors were defined as "the failure of planned actions to achieve their intended consequences", while the violations were defined as "deliberate deviations from these practices that were considered necessary to maintain the safe operation of a potentially hazardous system" (Reason *et al.,* 1990).

The results from the questionnaire presented in this study show that most road users are

aware of the negative road safety effects of risky traffic behaviors. However, the statistical analysis of this study showed that Palestine country had higher scores on driving errors and ordinary and aggressive driving due to higher levels of collisions attributed to less developed infrastructure and road equipment or higher levels of driver stress. Driving beyond the speed limit or speeding that is not within the limits of the road environment is a key risky behavior. Palestinian drivers declare better speed driving performance than Greek drivers. Regarding the commitment of traffic rules, it was pointed out that Palestinian drivers have better positive behavior than Greek drivers, except for the use of belt or driving under the influence of alcohol or drugs in which Greek drivers have better safety behavior. Differences between the two countries regarding these behaviors can be explained by different attitudes towards alcohol and drugs use in the general population, differences in legislation, and variable perceptions of the probability of police scrutiny. Demographic factors are probably important in interpreting the findings from the research.

Looking at the results of analysis of logistics analysis for Greece and Palestine, it was found that there is different behavior of drivers and as a result of road accidents by different groups of drivers in both countries. Based on the resulting values, it is noted that the diversity of drivers' ages is the most important in matters that contribute to the occurrence of road accidents in both countries, with the difference in the order of other characteristics. However, driver age and gender characteristics tend to be related to ADQ scores as well as with crash rates. Furthermore, education is a key demographic factor that characterizes driving behavior. In addition, the arrangement of the highest values of odds ratio of factors is different between Greece and Palestine. Therefore, there are variation in behavior and attitudes among drivers in terms of different countries.

The various threats of the study for the validity and the way that we attempted to alleviate them are presented. Considering the construct validity, the extent to which various factors accurately measure the concepts they intend to measure, the following potential threats have been identified: The design of the questionnaire was based on literature review analysis, taking into consideration different factors that contribute to the road safety problem in Palestine and Greece. Comprehension of the questions is difficult to measure, because it is based on the subjective estimation and experience of the participants. The limitations of the research data are the impact of cultural differences between the two countries. Country road users may have different cultural interpretations of the research questions. Factors such as social values, capabilities, personality, the role of an individual's status, laws, road safety culture, and infrastructural differences vary between countries and may influence the responses of road users.

In terms of external validity, the extent to which the survey results can be generalized to the study population and other research settings, the number of 830 participants was randomly selected. It is noted that Palestine suffers from problems and limitations in the data, lack of accuracy and lack of statistical series that allow the monitoring of road accidents. Some of the problems observed are the lack of sufficient information about different age groups, the lack of standardization and classification of road

accidents and the lack of commitment of many of the competent official departments to record accurate information about road accidents. In general, it would be difficult to predict how the above threats might have affected the results. Although external threats limit the generalization of this research, they do not limit the results used as a basis for future studies.

5. Conclusion

This study is the first study related to the performance of road safety drivers in Palestine. Based on the results of the study, several findings are obtained. The four-factor ADQ is successful as a means of assessing driver behavior. In addition, it is characterized by clarity in terms of understanding questions and completing online. Most of the questions are statistically significant in terms of differences in driver responses between Greece and Palestine, which shows the variety of drivers' behaviors depending on the variety of countries. The variation of drivers' ages is considered the most important that contributes to the occurrence of road accidents in Greece and Palestine compared to the other characteristics. The different characteristics of countries, such as diversity in culture, traffic regulations, economic situation, road infrastructure, etc. result in drivers' performance and behaviors.

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