

Contribution of Driving Anger and Aggression in the Prediction of Driving Behavior

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ABSTRACT

Traffic violations and aggression are often regarded as social issues with important social and economic consequences. The present study investigated the potential contribution of demographic variables, driving anger, and aggression on the prediction of aggressive driving behaviors. The sample population consisted of 168 male drivers with an age range of 19–30 years old and the average driving experience of 9 years. All participants filled out the self-reported scales that assess driving anger, aggression dimension, and driving behaviors. Based on the participants' responses to the trait-anger dimensions in Spielberger State-Trait Anxiety Inventory, they were re-categorized in three driving anger categories of high-trait-anger, medium-trait-anger, and low-trait-anger. All of the participants had a driving certificate. The results of this research indicate that: (1) for almost all variables, the effect of anger was significant, (2) anger situation had a contribution in the prediction of lapse, errors, and violations, (3) demographic variables, driving anger, and aggression were all involved in a complementary manner in predicting the driving behavior, and (4) aggression was the best predictor of the violations. Future research is recommended to continue to investigate the effect of various environmental, social, psychological, and personality factors on risky driving behaviors in order to identify appropriate treatment and prevention strategies for this societal concern.

KEYWORDS: *Driving Anger, Aggression, Driving Behavior*

INTRODUCTION

It is estimated that each year, 2 million people die in road accidents worldwide [1]. Data from the World Health Organization (WHO) show that Iran has one of the highest mortality rates from road traffic injuries in the world [2]. According to various studies, Iran has a higher mortality rate in road accidents than the American and European countries [3]. According to the statistics released by WHO in 2000, the mortality rate was 35% in Iran, 18% in the East Mediterranean, and 25% in the world, which shows the higher mortality rate in Iran [4]. In addition, the number of injured people in car accidents worldwide is estimated at over 15 million [5]. Compared to the other countries in the world, Iran has improved dramatically in terms of accident prevention. From 1990 to 1993, the trend of improving the accident index was slow or negative in other countries. This

index value was 2.2% in North Korea, 16% in England, 18% in France, 7% in Denmark, 2% in Pakistan, 1.2% in India, and with a significant difference, 55% in Iran [6]. The road events, as the second cause of road accident mortality in the world [8], are the most prevalent cause of injuries and mortality in Iran [7].

According to authentic studies, road traffic accidents account for 29% of the casualties in Iran [9]. In recent years, some investigations have been conducted to analyze road traffic accidents, indicating human factors or human behavior as the most important factor in such accidents [10]. It is often contended that aggressive driving behaviors are common on the roads, and there is evidence that aggressive driving is associated with accidents [11]. Baron and Richardson defined aggression as "any form of behavior directed towards the goal of harming another living being who is motivated to avoid such treatments" [12]. It is often not possible to determine

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the goal of drivers by risky driving. Many instances of dangerous driving behavior may be due to poor technique or lack of skill rather than the intention to harm others. However, there is some evidence that intentional aggressive driving is by no means rare.

Parker et al. [13] found that 89% of the drivers under study admitted that they sometimes commit aggressive violations against other drivers to demonstrate anger. The similar findings were declared by Underwood et al. [14]. According to the study, 85% of the participants experienced anger in at least one occasion during the last 2 weeks. In this study, driver aggression was considered to be an instance of hostile aggression [15], because it was correlated with the experience of anger. Anger is defined as a self-perceived phenomenological state that is negative in nature [16]. Driving-related anger was conceptualized as a personality trait related to anger [17].

The anger trait reflects a broad tendency to experience anger more frequently and intensely across situations (i.e., the tendency to become more easily angered by irreverences, offenses, injustices, and frustrations, to react with more anger, and to experience more negative physical, social, vocational, and psychological consequences) [18]. There are many causes why people become angry and aggressive when driving; driving is a potentially dangerous activity that involves interacting with other people in an environment in which there is no means to communicate [19].

There is little chance of explaining one's actions, questioning the performance of other drivers, or discussing/compromising with them [20]. Although there is little chance of communication between drivers while driving, traffic provides a good environment for conveying messages between drivers [21]. The results of some studies to identify the causes of aggression in drivers have shown that "the behavior of other road users" is the most likely cause of anger and aggression. Particularly, it has been shown that the perception of hostility in the behavior of other drivers provokes anger in many people and, in some cases, this continues until generating an aggressive reaction [22, 23].

It is also known that the tendency to be aggressive is a fairly stable trait that persists over time and in various situations [15]; thus, individuals who exhibit aggressive behaviors in other fields of their lives tend to be aggressive drivers, as well [22]. Driving behavior is associated with individuals' personal driving habits, including the way one chooses to drive [24]. This study examines the relationship between anger and risky driving behavior. Depending on the type of anger measured, it was assumed that aggression would be related to violations. The above-motivated content suggests that the type of anger measured may influence driving behavior. Therefore, it was decided to investigate the relationship between aggression and driving behavior by anger type (i.e., trait anger).

MATERIALS AND METHODS

The study was conducted in 2017 at the taxi agencies nearby Iran University of Medical Sciences, Tehran, Iran. A voluntary sample of 234 taxi drivers was selected through a stepwise interview with all drivers. The inclusion criteria were willingness to participate in the study, being healthy, having at least 4000 km of driving a year, having a driver's license, and having more than 3 years of driving experience. In the first phase of the study, the aggression questionnaire was distributed among the drivers. The questionnaire was anonymous and consisted of two parts. The first part contained general socio-demographic data, including age, marital status, education level, driving experience, and accident cases over the past year. The second part included questions on the aggression. In line with the objectives of the study, aggression was re-categorized into three driving anger groups of high-trait-anger ($31 < \text{trait anger} < 40$), medium-trait-anger ($21 < \text{trait anger} < 30$), and low-trait-anger ($10 < \text{trait anger} < 20$). The participants were included in the study based on their responses to the trait-anger dimension in the aggression questionnaire. Out of the target population, 179 drivers were selected based on anger scores. Drivers were called to explain to them the study conditions. If interested, the informed consent form and schedule were read for them. Six drivers with the high-trait-anger, three with medium-trait-anger, and two with low-trait-anger withdrew from the collaboration at this point because of scheduling problems. Low-trait-anger drivers were pulled out randomly from the pool of low-anger drivers until their number matched the number of drivers in the high and medium-trait-anger groups. Finally, this study was conducted on 168 drivers divided into three groups of 56 members. The participants in the higher aggression group (high-trait-anger drivers, $n = 56$) all reported five or fewer accidents in the past year. The drivers in the medium-trait-anger group ($n = 56$) declared three or fewer accidents and those in the low-trait-anger ($n = 56$) reported two or fewer accidents over the past year.

In the second phase of the study, the driving behavior questionnaires were distributed among the drivers to compare the driving behavior in three groups of anger.

Measurement tools

Driving aggression survey: Spielberger State-Trait Anger Inventory (STAI) was used to study the driving aggression among the participants. This inventory is a highly valid instrument and a standard test for aggression [25]. The questionnaire was first developed and used by Spielberger in 1983. It was normalized for Iranian population in 2005, and its validity was assessed and confirmed by the concurrent criterion validity. Some other

prominent researchers have also evaluated the reliability of this questionnaire. The reliability of this tool was calculated by Cronbach's alpha above 0.9 for the state and trait aggression. The STAI is a 57-item self-evaluation questionnaire, which includes three separate subscales.

Trait anger scale: The Trait-anger scale (TAS) is a 10-item measure of an individual's global or chronic tendency to experience anger assesses how people "generally feel" about anger. It has a 4-point scale as 1 (almost never), 2 (sometimes), 3 (often), and 4 (almost always). Individuals with high levels of anger are expected to view a wide range of situations as anger triggers and respond to these situations as expressive anger [26].

State anger scale or driving anger scale: The Driving Anger Scale (DAS) is a 15-item measure of the tendency to become angry during driving, evaluating how respondents feel about anger "right now at this moment". It includes four scales of 1 (not at all), 2 (somewhat), 3 (moderately so), and 4 (very much so) [27]. Each item represents a problematic driving scenario. The study has shown that there are moderate correlations between the TAS and DAS ($.27 < r < .33$ [28]).

Anger expression scale: The Anger Expression Scale (AXEX) is a 32-item measure of the expression or control of anger. Similar to the TAS, the items are rated based on a 4-point rating scale. The AXEX is comprised of four subscales, including the 8-item Anger Expression-Out scale ($\alpha = .74$; measures the degree to which anger is expressed in verbally or physically aggressive behavior), the 8-item Anger Expression-In scale ($\alpha = .75$; evaluates the tendency to suppress or withhold angry feelings), the 8-item Anger Control-Out scale ($\alpha = .86$; assesses the degree to which angry feelings are controlled but outwardly expressed), and the 8-item Anger Control-In scale ($\alpha = .89$; measures the degree to which an angry person is able to calm down and reduce his/her anger) [29].

Driving behavior survey: The instruments used in this study are the most common driving behavior questionnaire (DBQ), including four behavior subscales and two major categories of violations (intentional and unintentional) and mistake (lapses and errors). Gras et al. sets the rates as 82%, 66%, 59% and 81% for each of the four DBQ subscales, including errors, lapses, intentional violations, and unintentional violations, respectively [30]. DBQ was first developed by Reason et al. (1990) in the Manchester University [31]. In the study by Oraizi and Haghaigh, the DBQ was translated to Persian and in order to test the reliability and intra-class

correlation coefficients of the different subscales, it was used for 293 Iranian drivers with high reliability. The obtained coefficient was 0.77 for the lapses, 0.81 for errors, 0.86 for intentional violations, and 0.65 for unintentional violations [32]. This survey contains 50 questions in four sections and the responses were scaled by the scoring range of 0-5 (never= 0, hardly= 1, occasionally= 2, mostly= 3, frequently= 4, and always= 5).

The highest score in each section is obtained from the four parameters that determine drivers' prevailing behavior. The questions differ from the two aspects, including the type of behavior and the extent of its harm to others. Harmfulness levels of these behaviors classified in three groups: (a) behaviors with no risk for other drivers on the road but to the extent that make them feel inconvenience (low risk contingency); (b) behaviors that may provide hazards for others (intermediate risk contingency), and (c) behaviors that certainly endanger other drivers (high-risk contingency).

RESULT

From a population of 234, 168 were selected for the study. All the drivers were informed how to use the scale and no one had trouble filling it. The average age of the participants in each subsample was 27.54 years old (High-trait-anger), 28.57 ± 2.11 years old (Medium-trait-anger), and 28.70 ± 2.08 years old (Low-trait-anger). The average driving experience of participants was 8.84 years in the high-trait-anger, 8.96 years in the medium-trait-anger, and 9.09 years in the low-trait-anger subsample. Table 1 presents details of these categories. Tables 2 and 3 provide the mean and standard deviation values of the aggression and driving behavior dimensions in the subsamples. As the tables suggest, the average value of the aggression and driving behavior in high-trait-anger group was the highest in all the dimensions except for the dimension of anger control-out. These values in the medium-trait-anger were higher than those in the low-trait-anger. Table 4 presents the pairwise correlation coefficients between driving behavior, aggression, and accident. Pearson's correlation coefficient indicates that there is a significant and positive relationship between driving behavior and aggression. There is also a significant and positive relationship between driving behavior and accidents. The correlation between the variables among the drivers with the high-trait-anger was more significant than the other two subsamples. The stepwise multiple regression analysis (see Table 5) was used to investigate the relationship between age, education level, marital status, driving experience, accident cases, and aggression as independent variables and the driving

behavior measures (lapses, errors, and violations) as the dependent variable. This method was chosen because the present study has an exploratory purpose. The stepwise multiple regression allows eliminating incremental variables and retaining all the important variables [33]. A model was created from the driving behavior variable.

The model combines multiple numbers of predictors (6 variables as independent variables). In general, age, marital status, driving experience, accident cases, and aggression were considered as independent variables and the different driving behavior measures as dependent variables (lapses,

errors, and violations). Education level could not predict the driving behavior measures (lapses, errors, and violations). The aggression predicted serious driving violations.

The correlation between the components of aggression and deriving behavior is presented in Table 6. According to the table, the dimensions of aggression correlated with all dimensions of the driving behavior, except for anger expression-in and anger expression-out.

The correlation between the aggression and intentional violations is higher than the other dimensions of driving behavior.

Table 1. Characteristics of the drivers

Aggression groups Variable	Grouping	%	Mean±SD		
High-trait-anger (n=56)	19-25	16/1	27.54±3.36		
	26-30	83/9			
	Age	high school dropout diploma		25	
		academic degree		37/5	
	Education	Single		19/6	
		married		25	
	Marital status			75	8.84±1.218
	Driving experience	0		16.1	1.86±1.257
		1		23.2	
		2		32.1	
3		17.9			
Accident Cases	4	8.9	1.86±1.257		
	5	1.8			
Medium-trait-anger (n=56)	19-25	8.9	28.57±2.11		
	26-30	91.1			
	Education	<diploma		21.4	
		diploma		41.1	
		academic		32.1	
	Marital status	Single		23.2	8.96±1.307
		married		76.8	
	Driving experience	0		21.4	1.29±.909
		1		37.5	
		2		32.1	
3		8.9			
Low-trait-anger (n=56)	19-25	3.6	28.70±2.08		
	26-30	96.4			
	Education	<diploma		12.5	
		diploma		26.8	
		academic		51.8	
	Marital status	Single		28.6	9.09±1.133
		married		71.4	
	Driving experience	0		32.1	0.95±.773
		1		41.1	
		2		26.8	
Accident cases					

DISCUSSION

In general, the results of this study were consistent with that of the previous studies on the relationship between driving behavior and aggression.

However, this research differs from previous studies in two main respects:

- 1) Grouping the participants into three groups of anger (high-trait-anger, medium-trait-anger, and low-trait-anger)

- 2) Investigating the correlation between driving behavior and accident cases

The main findings of this research can be summarized as follows:

- The effect of anger was recognized significant in almost all of the variables. The high-trait-anger drivers were given a higher than the drivers with low-trait-anger in all dimensions, except for anger expression-in and anger expression-out.

Table 2. Mean and standard deviation of the aggression dimensions

Aggression dimension	Anger-trait	Anger-state	Anger expression-in	Anger expression-out	Anger control-in	Anger control-out	Total score
Mean±SD *H *P	32.52±1.829	43.25±3.070	20.41±3.612	23.18±2.413	19.45±2.544	25.63±2.787	156.71±6.002
Mean±SD **M *P	24.02±2.363	34.16±4.093	18.95±2.075	19.68±3.231	21.82±2.167	21.34±3.502	118.34±18.530
Mean±SD ***L *P	13.52±1.789	17.25±3.123	21.41±2.034	14.91±3.450	22.39±2.549	17.91±2.617	115.11±6.231

*H: High-trait-anger

**M: Medium-trait-anger

***L: Low-trait-anger

*P: P-value

Table 3. Mean and standard deviation of the driving behavior dimensions

Driving behavior dimensions	slips	mistakes	Intentional violation	Unintentional violation	Total score
*H Mean±SD P	63.75±8.777	32.20±3.821	59.00±7.050	7.00±1.388	162.48±18.964
	.000	.050	.000	.000	.000
**M Mean±SD P	48.00±7.551	25.61±4.446	37.73±6.948	7.00±1.388	118.34±18.530
	.011	.037	.000	.048	.022
***L Mean±SD P	41.73±5.904	21.05±4.078	20.02±4.622	5.75±1.587	88.55±13.316
	.024	.000	.000	.006	.000

Table 4. Correlation between the driving behavior and aggression

Aggression group	Total score of aggression	Accident cases
High-trait-anger		
Total score of driving behavior	*P 0.001	0.021
Correlation coefficient	0.890	+0.613
Medium-trait-anger		
Total score of driving behavior	*P 0.009	0.005
Correlation coefficient	0.554	+0.370
Low-trait-anger		
Total score of driving behavior	*P ₁ 0.040	0.165
Correlation coefficient	0.344	+0.188

Table 5. Inter-correlation between the variables

Model	Unstandardized coefficients		Standardized coefficients		t	Sig.
	B	Std. Error	β			
Constant	78.770	19.840			3.970	.000
Age	8.374	4.989	.071		1.679	.025
Education	.891	1.480	.025		.602	.548
Marital status	1.754	3.597	.022		.488	.060
Driving experience	.780	1.141	.027		.684	.034
Accident cases	2.311	1.295	.070		1.784	.001
Aggression	1.606	.080	.833		20.167	.000

Table 6. Correlation between the components of aggression and deriving behavior

Driving behavior dimension	Intentional Violation		Unintentional Violation		Mistakes		Slips	
	Correlation coefficient	P-value	Correlation coefficient	P-value	Correlation coefficient	P-value	Correlation coefficient	*P-value
Aggression dimension								
Anger-state	+.953	.000	+.637	.000	+.788	.000	+.746	.000
Anger-trait	+.912	.000	+.615	.000	+.726	.033	+.690	.000
Anger expression-in	-.494	.02	-.251	.026	-.392	.000	-.377	.030
Anger expression-out	-.878	.000	-.511	.039	-.746	.000	-.800	.048
Anger control-in	+.595	.000	+.439	.007	+.586	.018	+.468	.024
Anger control-out	+.862	.012	+.515	.000	+.755	.000	+.773	.005

*p<0.05

- The aggression groups had a role in the prediction of lapses, errors, and violations. Accordingly, it was concluded that the high-trait-anger drivers would be involved in more risky driving than those with the medium-trait-anger and medium-trait-anger drivers were at a higher risk of dangerous driving than those with low-trait-anger.
- The variable of accident cases was positively correlated with the driving behavior dimensions, including lapses, errors, and violations.
- Age, driving experience, marital status, and aggression were involved in a complementary manner in the prediction of driving behavior. Aggression was the best predictor of violations.

The findings reveal that high anger drivers are more likely to engage in risky behaviors while driving than low anger drivers [28, 34, 35]. These results agree with the previous studies arguing that in the face of other drivers' violations, high-trait-

anger drivers tend to express anger more than those with low-trait-anger [36]. However, in our sample, the difference of anger between the groups was not significant for the aggression subscales of anger expression-in and anger expression-out. This may be due to the fact that high-trait-anger may be more likely to complain of unfavorable traffic conditions, but they don't express anger with the intention to commit a violation. Depending on the circumstances, high-trait-anger drivers are more likely to judge whether the traffic law is important or not. High-trait-anger drivers feel that they have more driving skills. These results strongly indicate that violations are associated with driving anger and aggression. Concerning driving anger, many studies have suggested a link between the dimensions of anger and risky driving behavior [22, 34, 37, 38].

About aggression, the results of this study suggest that a driver with a general tendency to aggression will be more likely to commit slips and violations on the road. This finding is consistent with the study by Jamalizadeh et al [22] in which it

has been suggested that the difference in one's tendency to aggression may be reflected in driving behavior. This result is also consistent with the idea that personality characteristics, such as aggressiveness, are related to the higher rates of risky driving behaviors and negative driving outcomes [39-44]. One of the most important findings of this study is that driving anger and aggression are involved in a complementary manner in the prediction of slips, mistakes, and violations. In agreement with the previous studies, driving anger is involved in the prediction of violations [44].

CONCLUSION

The overall purpose of this study was to combine predictors of driving behavior, including demographic variables, driving anger, and aggression. The results showed that anger has a significant effect on the prediction of almost all variables. High anger drivers were scored higher than the drivers with low aggression in all the variables examined, except for anger expression-in and anger expression-out. High anger drivers were also involved in the prediction of lapses and errors. High anger drivers would be involved in more driving lapses and errors than low anger drivers. In addition, aggression was positively associated with driving behaviors, such as lapses, errors, and violations. This study suggests 1) to investigate the personality aggression dimensions of the driver's license applicants before receiving it; 2) to conduct a periodic psychiatric assessment of drivers (private or public) at regular intervals and at the time of license renewal. It is also proposed to hold training programs (as face-to-face or distance learning) for drivers in a real need of training or risky drivers and suspend their driver's license until obtaining the passing score; 3) to organize training courses by the relevant institutions on how to control aggression and make it compulsory for driver's license applicants to attend in these courses; 4) to obligate high anger drivers to fill out and submit aggression declaration forms periodically to the traffic department; 5) to increase the number of fines for violations committed by risky drivers, and 6) to increase the seizure duration of risky drivers' vehicles.

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