

# Instrumental and Hostile Behavior: Factors Affecting Aggressive Driving

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## Abstract

Aggressive driving is perceived by many users as one of the most important problems in driving. Aggressive driving is a crucial problem in Iran and also in many other countries. The purpose of this study is to analyze the driving aggression conceptual model and the assess effect of the theory of planned behavior subsets on aggressive driving behavior questionnaire and determine the index for aggressive driving behavior. Drivers' behavior is assessed with questionnaire which included 54 questions and was randomly distributed among 400 drivers. Confirmatory factor analysis, Structural Equations Model and regression are used to analyze the data. Demographic variable, theory of planned behavior and Shinar's model variable are considered in this study. Fitness indicators such as Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI), respectively equal to 0.98 and 0.93, pointed that the model is reliable. The Root Mean Square Error of Approximation (RMSEA) also indicates that the model is suitable and its value is  $RMSEA \leq 0.08$ . The comparative fit index value is greater than or equal to 9.0 and in line with other indices, confirming the model is good. In this way, the model presented in the study has proper and consistent indicators ( $\chi^2 = 81.9$   $p < 0.000$ ,  $AGFI=0.93$ ,  $GFI= 0.98$ ,  $RMSEA =0.064$ ), theories and other factors are able to explain aggressive behavior. The personality traits do not play a role in explaining the drivers' aggressive behavior. The subjective norm, and perceived behavior control are related directly to the drivers' aggressive behavior. Drivers' demographic characteristics are analyzed with regression and they do not play any role in aggressive behavior. Also, the attitude has the greatest impact from which it can be stated that the theory of planned behavior has an indirect effect on the aggressive behavior. The present study identifies that theory of planned behavior components is directly associated with aggressive driving behavior.

**Keywords:** Aggressive Driving, Structural Equation Model, Theory of Planned Behavior, Theory of Risk Homeostasis, Instrumental and Hostile Aggression.

## 1. Introduction

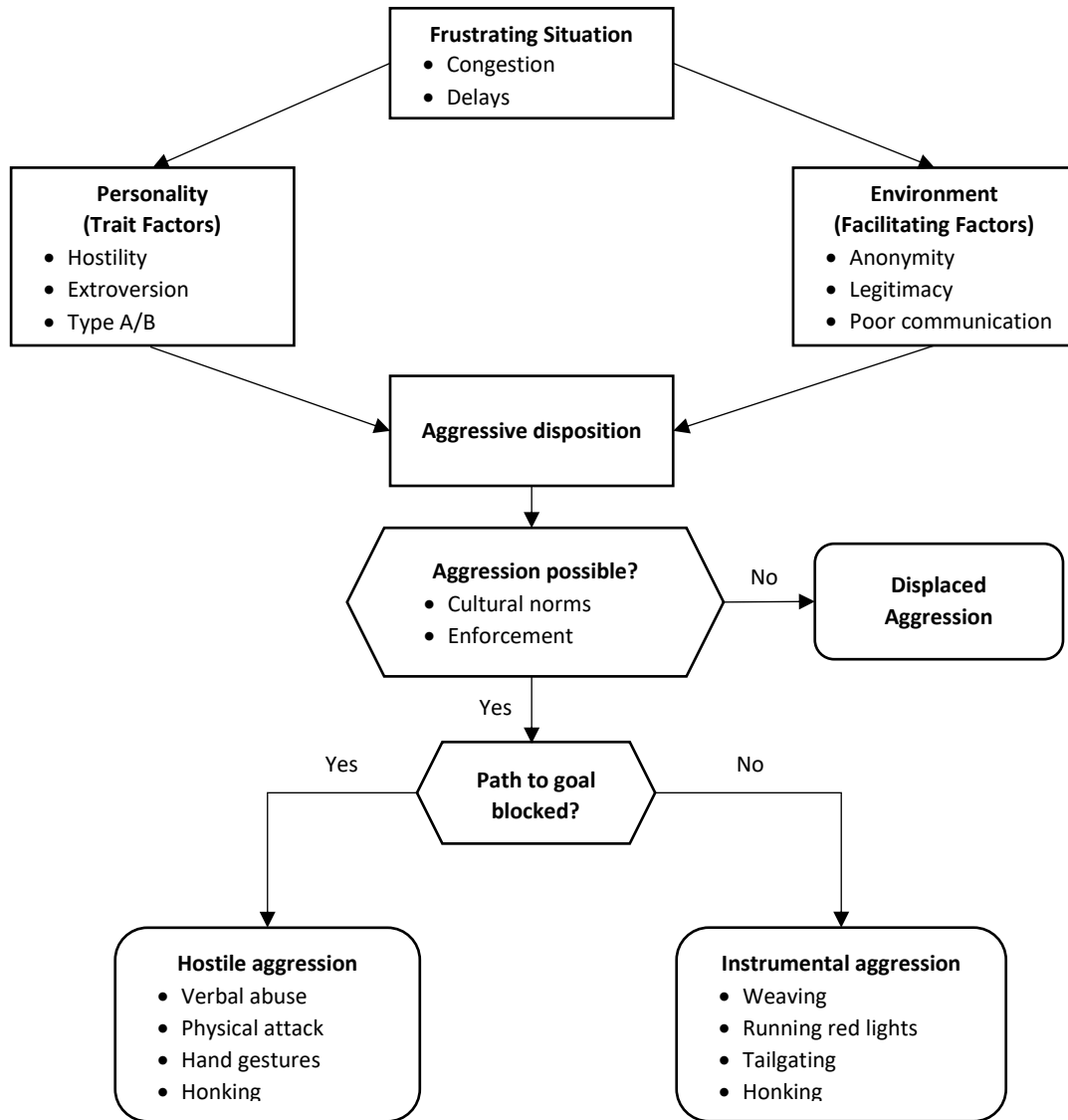
Aggressive driving is perceived by many users as one of the most important problems in driving. It is defined as "any driver's behavior that will be prone to offend others physically or emotionally while driving" [1–5]. Aggressive driving is known as an unusual driving behavior that is done deliberately and regardless of the safety of other drivers [1–3]. About 56 percent of fatal accidents are due to aggressive behavior such as speeding, delay, and driver personality traits [8]. Aggressive driving behavior in many situations involves flashing, tailgating, horn-honking, yelling, and hand gesturing. In many cases, aggressive driving involves more than one type of behavior. For example, the speed limit violation alone does not lead to aggressive driving, but with continuous line changes, honking, and flashing cause aggressive behavior and eventually aggressive driving. Alonso et al [9] assessed aggressive driving concepts in 2019. They found that drivers have different opinion about what the aggressive driving is. Furthermore, drivers show different declination according to their personal life and socio-demographic traits. Also, he understood that the behavior causes damage to others with objective could be considered as aggressive behavior in any life circumstance.

In an Austrian study, aggressive behavior caused by drivers' frustration was evaluated. According to the results of this study, those with the most aggressive behavior had the most crashes in the past three years, and with increasing emotional constraints (such as frustration and driver blame), they showed aggressive behavior more than other road users [6,10].

The investigation of aggressive behavior and aggressive driving in psychology is necessary. In this regard, a study was conducted by Adnan et al [7] to investigate the effect of personality traits on aggressive and risky driving. He concluded that all personality traits had substantially affected drivers' behavior. He realized that risky driving and aggressive driving are multi-dimensional behavior and should be assessed with more personality traits. In Nigeria, a cross-sectional study was conducted to estimate the influence of demographic and personality traits as predictors of risky behavior. They understood the five-point personality traits predicted risky behavior, offender's behavior and hostile aggressive behavior, whereas demographic variables (age, gender, occupation, marital status, educational level, driving experience and religion) were significantly weak predictors of offenders' behavior [4,5]. Drivers' hostile anger and the high level of competitiveness also lead to aggressive and dangerous behavior. To investigate the effect of negative feelings (like frustration) and perceptions, Willemsen et al. [13] have taken three factors into account: risky driving, aggressive driving and driving with negative perceptions and feelings. They found that risky driving is similar to aggressive driving, even though, a driver is unlikely to cause harm to other people in risky driving. In 2016, a study was conducted to determine an index for aggressive driving scale (ADS) and its purpose was to investigate the effect of drivers' anger on this behavior [14,15]. According to the results of this study, one of the most important criteria in the prediction of aggressive driving is the violations and the number of crashes of those whose violations are seriously more than other people. According to the observations, men are more likely to show aggressive behavior, and the most common aggressive behavior was verbal. According to a study conducted in China [14-15], they found that the view of revenge and personality traits were a significant variable of hostile driving, and despite cultural differences, the actions and attitudes of drivers and their behavior are compatible and similar to previous studies in other cultures.

Most of the studies have examined the effects of personality traits and psychology (such as impatience, anger, etc.) on aggressive driving. Also, studies concentrate on the cause of aggressive driving and what factors force people to show such behavior. In the Shinar research, personality, environmental and frustration characteristics were deemed as essential and effective factors in

aggressive behavior [18]. In fact, these models are suitable for explaining driver aggressive behavior (see Figure 1).



**Figure 1. Driving aggression conceptual model; interaction between personality trait, environmental and frustration factors [19].**

The purpose of this study was to evaluate the driving aggression model in the framework of theory of planned behavior by questionnaire and examine the relation between demographic variable and aggressive driving. Furthermore, affecting theory of planned behavior subsets in predicting aggressive driving behavior was the second aim of this study.

The Theory of Planned Behavior (TPB) is a general model which is designed to rectify for the constraint of an individual's incomplete volitional control [16]. In TPB, the individual's intentions are anticipated by their attitudes, their subjective norms, as well as perceived behavioral control [16]. Ajzen proposed a model of Theory of Reasoned Action (TRA) to determine human behavior, which addresses the impacts of cognitive components of attitudes, subjective norms, and behavioral intentions [20]. The theory demonstrates that the intention of engaging in certain

behaviors, which may further lead to the enactment of the behavior, can be predicted from an individual's attitudes towards that behavior and the personal norms representing an individual's perception of others' views concerning that behavior. In TRA, the intention to display a particular behavior is predicted by the personal factor of attitude towards the behavior and a social factor of a subjective norm [20,21].

Risk homeostasis theory is the particular well-known model, which usually for a host involving overall driver behavior [19]. The focal operator of this concept is known as purpose hazard which can end up being either relatively stable in addition long lasting relevance in order to cultural norms and values (e.g., inexpensive, peer-group attitudes, level of learning, age group, and gender), or shorter-term and happen within a person (e.g. peculiar goal involving travel or immediacy to arrive on time, mood, exhaustion) [22]. People tend to assess the risk they are usually taking and assess to the amount regarding risk they would including to accept. To become more precise, if the risk is lower than acceptable, drivers will alter behavior to be more harmful; if the risk is definitely evaluated as higher than tolerable, drivers will rectify risk with additional prudent action [23].

Since the use of behavioral models has a significant role in explaining driver behavior, we examined the drivers' aggressive behavior in the framework of the driving aggression model using the theory of planned behavior, the theory of risk homeostasis. According to behavioral models, attitude, subjective norm, and perceived behavior control were measured along with other conditions (environment, frustration, and drivers' personality).

The model presented in the Shinar's studies [9] is not quantitatively studied and is merely a conceptual model. That is why in this study, it is attempted to analyze the effect of important factors on aggressive driving and determine the index for it. The most important factors considered in this study are (1) demographic variable (age, gender, education, and occupation), (2) frustration (delay, crowding), (3) personality traits (impatience, hostile behavior), and (4) Environmental factors (anonymity, legitimacy).

The following ethical consideration were put into the study during research period:

1. The dignity and wellbeing of drivers was protected at all times.
2. The research data remained confidential throughout the study and the researcher never used drivers' name or other private information.
3. There was no obligation for drivers to participate in this study
4. All participants were offered the option not to answer questions or to withdraw from the study at any time.
5. Drivers were aware of this study's objectives.

## **2. Methods**

To assess the goals of the study, a questionnaire with 54 questions was designed. The questionnaire was distributed randomly among 400 volunteers who had driving license and over the age of 18 years in different part of Qazvin city of Iran. This study was conducted in 2018. In this experimental research, the questionnaire was a combination of Dula and Huang [13,24] studies questionnaires. In this questionnaire, demographic variables included factors such as age, gender, education, and occupation. The questionnaire has 5 Likert scales (1=completely disagree, 2=disagree, 3= No Idea, 4=disagree, 5=strongly agree). In order to predict more precisely, an index is determined for the hostile and instrumental behavior separately. For example, the drivers' attitude comprises 11 questions with each question having a score of 1 to 5. The minimum and maximum score of this sub-scale are 11 and 55 points respectively. To validate the index, item

analysis is used. Data were analyzed by IBM SPSS Amos 22. The questionnaire of Dula and Huang studies were used and with the help of a sociologist, this questionnaire was localized according to Iranian culture. First, 45 drivers answered to the questions and if there and after three weeks, this questionnaire, with different order in questions, was distributed among the same people. If people had a problem in understanding the questionnaire, it was explained to them and then tried to simplify those questions in the next steps. Finally, the questionnaires were printed and distributed randomly among people who had driver license in random places in Qazvin city. The obtained information was also entered into the SPSS numerically (Likert scales).

## 2.1. Material

Demographic variables in this study, including age, gender, education and occupation were asked and analyzed via the questionnaire.

Instrumental behavior includes behaviors that a person performs in order to surpass others and overcome the factor that has caused them frustration. This behavior includes honking at other road users, violating red lights, blocking other routes and etc. The drivers' behavior was evaluated with six questions, such as "When another driver behaves inappropriately, I honk the horn."

Hostile behavior involves behavior in which a person tries to hurt the frustration factor to feel better without untangle the problem. The hostile behavior was asked in eight questions in the questionnaire, such as "I deliberately block the way when the driver wants to overtake me."

In this questionnaire, the environmental factors include anonymity of drivers, driving at the peak hour, and driving under unsuitable weather conditions. This variable was asked by four questions and one of the questions is "How far do you drive in bad weather?" And the respondents answered to five scales "1=rarely" to "5=too high".

The drivers' attitude was asked as one of the subsets of the theory of planned behavior, with 11 questions. For example, "I don't need to fight because there are other ways to deal with being mad." The drivers' subjective norm is the second subset of the theory of planned behavior that was evaluated with three questions, such as "To what extent is friendship causing you to show aggressive behavior when driving?" Perceived behavioral control, the third factor of the theory of planned behavior, evaluated with 5 driver questions. For example, "How much control you have over your emotions and behavior while driving?"

There were two questions regarding a frustration involving a stuck behind the red light and being in a traffic jam, for example "I get angry when I get stuck behind the red light". The drivers' personality was evaluated by drivers' behavior with 13 questions, including an impatience and sensation seeking, such as "I'm angry when a car carelessly moves in front of me unreasonably" And the driver was asked to rate his agreement to answer the questionnaire with 5 Likert scales (1=completely disagree, 5=strongly agree).

The base questionnaires were used in different countries and studies and also alpha Cronbach was 0.79 for this variable. Besides, in order to reliability and validity of this study, 45 drivers answered to the questions and after three weeks, this questionnaire, with different order in questions, was distributed among the same people. The relation between their answers before and after three weeks was examined and results cleared that there were no significant differences between target variables.

## 2.2. Data analysis

In order to analyze the effect of demographic variables on aggressive behavior and evaluate the effect of part of variables and predict the model, a regression method was used. The purpose of

this method was to determine the demographic variables affecting drivers' aggressive behavior by using SPSS 22.0 software. Then, the Structural Equations Model (SEM) was used to determine a conceptual model and define the relation among the important and significant variables from previous steps with the model presented in Figure 2.

The Structural Equations Model for the behavioral model based on the theory of planned behavior and the theory of risk homeostasis used in the research. Aggressive behavior, instrumental behavior and hostility behavior were considered as latent variables and other variables were considered as observed variables. Covariance was outlined and evaluated among the observed variables of the research, then their relationship with hostile and instrumental aggressive behaviors was investigated.

Descriptive statistics were used to give information about the demographic characteristics of participants. The questionnaire concluded driver's attitude, subjective norm and perceived behavioral control, risk homeostasis theory as well as personality characteristics (sensation seeking and impatient) to assess a driver's aggressive behavior (hostile and instrumental behavior). Also, the study includes frustration, environmental variable to predict driver's behavior more precisely and determine important effective variables. The Pearson correlation was performed to calculate the correlation between independent variables. Finally, SEM analysis was conducted to investigate the association between questionnaire variables and to determine the most practical variables in predicting participant's aggressive behavior, and also assessed driver's features in theory framework.

### 3. Results

According to the results of the demographic variable analysis in table 1, the most drivers' age (28.3%) ranged from 28 to 32 years old and were male (58.3%). Most of the participants had a master/PhD degree (58%) and full-time employment (47.1%).

**Table 1**  
**Descriptive statistics of demographic variables**

Variable	Percent
Age	
18-22	20.5
23-27	17.3
28-32	28.3
33-37	20
Older than 37 years old	14
Gender	
Male	58.3
Female	41.8
Education	
High school and lower	8.8
Bachelor	41
Master/PhD	50.3
Occupation	
No employment	19.6
Part time Employment	33.3
Full time employment	47.1

In this study, an index for the drivers' aggressive behavior was determined. According to this index, aggressive drivers were classified into hostility aggressive behavior and instrumental



4. occupancy	-0.39*	0.28*	-0.19	-								
5. Attitude	0.4*	0.24*	0.16	0.10	-							
6. Subjective norm	0.33	0.22	0.28*	0.14	0.58*	-						
7. Perceived behavioral control	-0.05	0.04	-0.11*	-0.02	0.32*	0.03	-					
8. Risk homeostasis	-0.12	0.26*	0.29	0.06	0.03	0.1	0.11	-				
9. Personality	0.17	0.13	0.20	0.08	-0.33	-0.27	0.07	0.11	-			
10. Frustration	0.40	0.33	0.32	0.28*	0.16	0.04	0.15	0.27	0.31	-		
11. Environment	0.10	0.42	0.24	0.37	0.50	0.48*	-0.36	-0.16	0.19	0.39	-	
12. Aggressive driving	0.07	0.15	0.27	0.12	0.44*	0.47*	0.38*	0.35*	0.22	0.36*	0.41*	-

\*\*p < 0.001

\*p < 0.05

According to Table 3 and Table 4, age and gender had no significant effects on explaining aggressive behavior, and also other demographic variables, education and occupation were not able to predict the drivers' aggressive behavior, so the first step could only explain 10 percent of the variance. In the second step, the R<sup>2</sup> increased by 37 percent with entering theories into regression. Among the theory's subscale, perceived behavioral control and subjective norm had an indirect relationship with the aggressive behavior. The attitude and the theory of risk homeostasis also had the most direct impact on drivers' aggressive behavior while driving. In the third step, personality traits did not have a significant relationship with aggressive behavior, and frustration had direct relationship and the environmental factors associated with the aggressive behavior indirectly. The third step could explain 11 percent of the variance. Regression results indicated that the demographic variable has not affected the drivers' aggressive behavior, they were eliminated from the model and structural equations have been used to evaluate other variables in the model. The results confirmed the behavioral model in regression. The following table will give a more thorough explanation.

Table 5 states that the Chi-square is substantial and the model does not describe a large part of the data. However, with a significant amount of Chi-square, the model cannot be rejected because it can be due to the sample size or small variations in the data [26]. Other fitness indicators such as Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI), respectively equal to 0.98 and 0.93, pointed that the model is reliable. The Root Mean Square Error of Approximation (RMSEA) also indicates that the model is suitable and its value is RMSEA ≤ 0.08 [27]. The comparative fit index value is greater than or equal to 9.0 and in line with other indices, confirming the model is good. In this way, the model presented in the study has proper and consistent indicators. ( $\chi^2 = 81.9$   $p < 0.000$ , AGFI=0.93, GFI= 0.98, RMSEA =0.064), theories and other factors were able to explain aggressive behavior.

The covariance between the factors instrumental, hostility, and Aggressive Driving were quite high, indicating that these two factors can be understood as closely related constructs (in model 1 covariance HD-AD = 0.80; ID-AD = 0.48). Also, the covariance between these two factors and attitude, perceived behavioral control (PBC) and subjective norm were small (in model 1

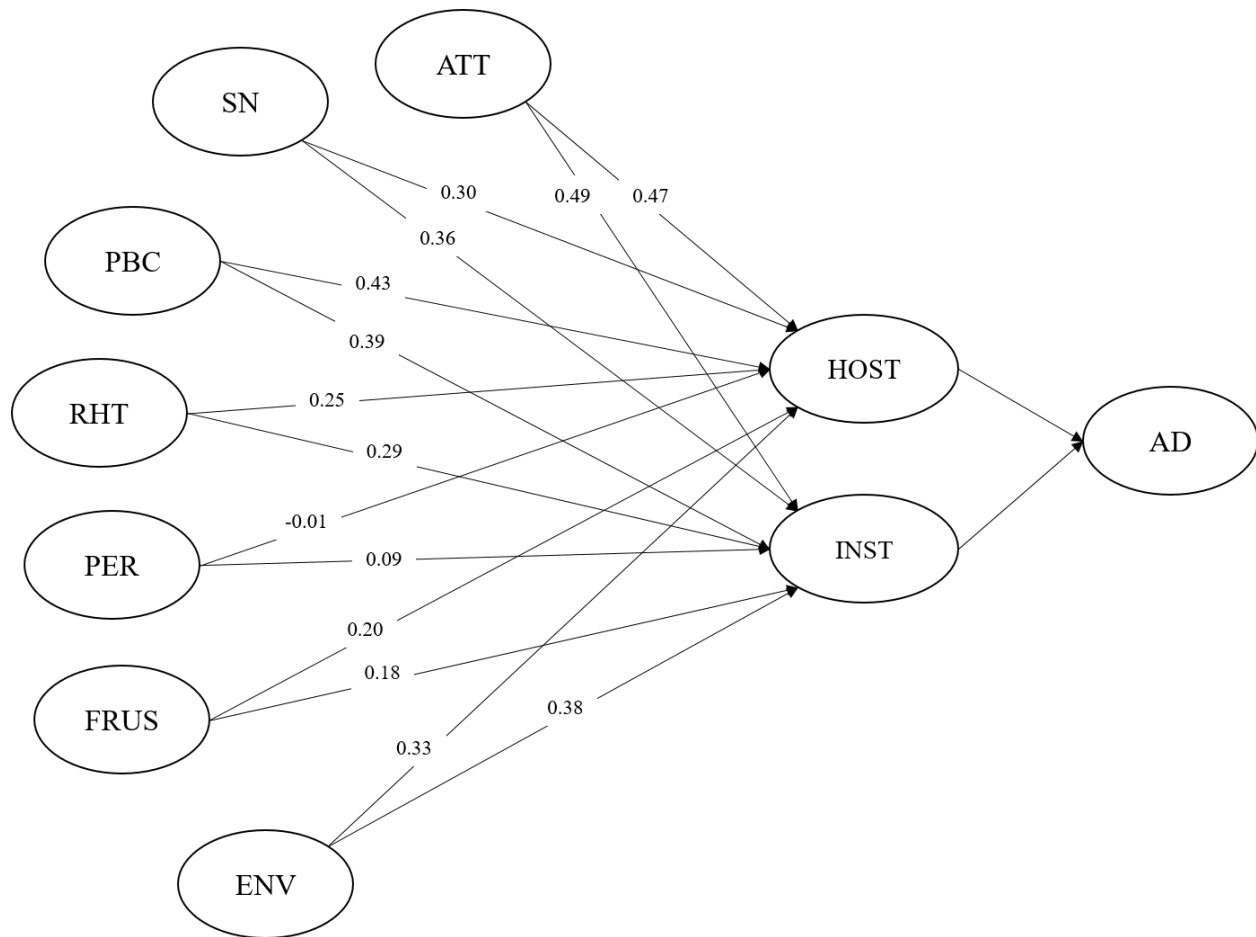


covariance Attitude-ID = 0.49; Attitude -HD = 0.38; subjective norm-ID = 0.35; subjective norm-HD=0.28; PBC-ID=0.36; PBC-HD=0.26). The covariance between these two factors and other factors was insignificant.

**Table 5**  
**Goodness-of-fit indices for the aggressive behavior**

Indices	$\chi^2$	d.f.	GFI	AGFI	RMSEA
Aggressive behavior	81.9	45	0.98	0.93	0.064

To examine the validity of the aggressive driving index, we did an item analysis with reliability (kr-20= 0.86; SD =12.24; S.E. =2.58) which provided a more accurate estimate of the reliability.



**Figure 2. final structural model with standardized path coefficient (variables abbreviation, ATT=attitude; SN=subjective norm; PBC= perceived behavioral control; RHT= risk homeostasis theory; PER=personality; FRUS=frustration; ENV=environment; HOST=hostility; INST=instrumental; AD=aggressive driving)**

In summary, descriptive statistics were used to give information about the demographic characteristics of participants. The questionnaire concluded driver's attitude, subjective norm and perceived behavioral control, risk homeostasis theory as well as personality characteristics (sensation seeking and impatient) to assess a driver's aggressive behavior (hostile and instrumental

behavior) by SEM. Also, the study includes frustration, environmental variable to predict driver's behavior more precisely. The Pearson correlation was performed to calculate the correlation between independent variables. Finally, SEM analysis was conducted to investigate the association between questionnaire variables and assessed driver's features in theory framework

#### **4. Discussion**

There are various factors that influence aggressive behavior. Instrumental and hostile behavior are important aggressive driving behaviors that the distinction between the two is very important. The main objective of the study was to determine the effects of demographic variables and driving aggression model variable on drivers' aggressive behavior and to determine the index for instrumental and hostile behavior. Data were collected by questionnaire among Qazvin people. Shinar's prospective model, theory of planned behavior and risk homeostasis theory was used to assess effects of factors on aggressive behavior. Demographic variables (age, gender, occupation, and education) are also considered in this study.

The main point that should be mentioned here is that all variables approximately have the same effect on hostile and instrumental behavior which means there are not any significant distinction between them, and it may be due to our variables and these two behaviors definitions are close together in many ways. In the present study, the drivers' age is not an important variable in predicting driver behavior, which is similar to the studies done by Willemsen et al. [13,28]. They found that the drivers' age was not effective in explaining aggressive and risky behavior. It may be due to the concord of age in this study. The second demographic factor studied was gender. According to the regression model, gender did not affect driver aggressive behavior, while the study conducted in 2018 indicated that gender is not only an effective factor but also men were more aggressive than women [29]. The main reason for this distinction could be that most participants (more than 50%) were men. Despite the results of this study, Parker found that there was no difference between women and men [30]. According to the regression model, the drivers' occupation was not significant while Zhang et al. [15] concluded and found that the occupation was directly related to the aggressive behavior and violations. The study conducted in Nigeria had the same results as the present study. They found that demographic variables had weak relation to aggressive driving [11]. The chief incentive for these differences might be variety combination of the demographic variables used in this research.

In many studies [27,31], it was found that sensation seeking impatient was very effective in predicting aggressive behavior and risky behavior and impatient has moderate effect. Also, in this field, research has identified personality traits as an important factor in aggressive behavior [32]. In this study, personality has low relation to instrumental aggressive behavior which may be because of our study concentrate on the instrument which confounded with sensation seeking and impatience.

Frustration and the environment influence on aggressive behavior [27]. Our results are not consistent with other studies. As found previously [33–35] driver's frustration has not any effect on predicting aggressive driving, and also one thing that can effect on frustration and environment variables is the driver's controllability which we didn't consider it in our study. However, some previous study [36] determined that there were association between aggressive driving, frustration and anger.

Among the theories used in the model, risk homeostasis theory is one of the most important ones affecting the drivers' aggressive behavior. It was related to both types of aggressive driving behaviors [22]. Among the subsets of the theory of planned behavior, the subjective norm, and

perceived behavior control are related directly to the drivers' aggressive behavior, and also, the results show that people have a positive attitude towards aggressive behavior and show more hostile behavior and it can be stated that the theory of planned behavior has an indirect effect on the aggressive behavior. These results are consistent with previous studies [37]-[40] and confirm that attitude was prominent variable in predicting aggressive driving, especially hostile behavior and positive relation can explain why drivers have aggressive behavior. Based on the behavioral models presented in previous study, all three variables of the theory of planned behavior influenced on aggressive behavior directly which shows the practical use of the theory of planned behavior in predicting driver's behavior [24].

## 5. Conclusion

In general, the theory of planned behavior, the theory of risk homeostasis has been effective in predicting the driver behavior ( $R\text{-HD}= 0.25$ ,  $R\text{-IN}=0.29$ ), and the attitude was the most effective factor in explaining the drivers' aggressive behavior ( $ATT\text{-HD}= 0.47$ ,  $ATT\text{-IN}=0.49$ ), demonstrating the suitability of using the theory of planned behavior, which has been in accordance with Ajzen's view of explaining this theory. Despite factors affecting aggressive behavior, personality traits ( $PER\text{-HD}= -0.01$ ,  $PER\text{-IN}= 0.09$ ) did not impact driver behavior, which could be because people avoid situations that endanger them and also should be noticed that we consider two characteristics and we didn't consider angry. In this study, the demographic characteristics did not affect the prediction of aggressive behavior.

- The personality traits did not play a role in explaining the drivers' aggressive behavior.
- The subjective norm, and perceived behavior control are related directly to the drivers' aggressive behavior.
- Drivers' demographic characteristics were analyzed with regression and they had not played any role in aggressive behavior.
- the attitude had the greatest impact from which it can be stated that the theory of planned behavior has an indirect effect on the aggressive behavior

For future studies, one can consider various aspects of personality traits such as impulsivity and different traffic conditions along with other features used in the study. The size of the sample can be increased for considering the effect of age and gender, and the insignificant effect of education and occupation can be due to the low dispersion of these variables. The present study helps to find out what different factors affect a drivers' aggressive behavior. Hence, actions to reduce aggressive behavior on the road require extensive and theoretical research in the field of psychology and driver aggression.

Unlike most studies, not only driver characteristics are mentioned, but other factors affecting drivers' behavior have been studied. Also, the effects of demographic variables such as driver education and occupation on drivers' aggressive behavior were investigated. The findings of this study give assistance to researchers to understand the factors influencing aggressive driving. Furthermore, these findings are affecting in identifying and screening aggressive driving.

## 6. Limitations

In the present study, some limitations may affect the results. The first limitation is that the aggressive behavior was assessed through a questionnaire and was self-reported that may affect the response of individuals. It can also be noted that none of the variables investigated in the study were observed on the road. Conducting this study in the road environment or simulation is very

efficient and leads to a more accurate exploration of more variables. The second limitation can be related to the variables. The aggressive variables evaluated in this study were limited, which can be expanded and evaluated like various types of aggression such as verbal aggression, physical disputes, etc. Personality traits and road rage have different and wide subsets which small number of them are considered in this study. Another limitation is that the demographic characteristics have no effect on the prediction of aggressive behavior. By expanding the sample, it may be possible to examine their effect more precisely.

### **Conflict of Interest**

On behalf of all the authors, the corresponding author states that there is no conflict of interest.

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