

The Relationship between Trait Anxiety and Driving Behavior with Regard to Self-reported Iranian Accident Involving Drivers

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ABSTRACT

Background: The aims of this study included: Determination of the most common driver behavior in drivers and also analyzing the relationship between trait anxiety (TA) with subscale of driving behavior (lapses, errors, ordinary and aggressive violations).

Methods: This cross-sectional study was conducted on 168 drivers that having crash. The self-reporting of the drivers was determined by using Manchester driving behavior questionnaire (DBQ) and Spielberger State-Trait Anxiety Inventory.

Results: Independent *t*-test showed that violations factor (ordinary and aggressive) are the most common behavior in drivers, Pearson correlation revealed that TA had a significant direct positive relation with all DBQ subscales especially error and lapses factor ($P < 0.01$) also Pearson correlation showed that age had a negative significant relation with factors of DBQ.

Conclusions: It can be concluded from the results (according to the relation between TA with error and lapses factor) that the rate of TA is destructive effective on the memory performance and process in the drivers and cause absent minded and memory imperfect function and process in these people during the driving.

Keywords: Drivers having crash, driving behaviors, trait anxiety

INTRODUCTION

Iran in comparison to the American and European countries has a higher mortality level of road accidents. According to latest forensic information's in 2007, 22918 people have died in Iran road accidents.^[1] The traffic events are the most prevalent cause of injuries in Iran,^[2] which considered as second cause of mortality of road accidents.^[3] The studies indicate that road accidents include 29% of mortality in Iran.^[4] With regard to the published statistics in 2000 by World Health Organization, the mortality in Iran is higher than the other areas of the world with the portion of 35%, East Mediterranean 18% and 25% in all of the world.^[5] The analyses of available data indicate that dead people index for every ten thousand vehicles is 2.5 for every ten thousand vehicles in developed countries and is 31.5 in developing countries.^[6]

The investigations in the recent years that are fulfilled for analyzing road accidents in Iran show that the most important factor in Iran is the human factor or the human behavior factor.^[7] Analyzing traffic accidents indicates that the main factor in the emergence of accidents is related to human factors.^[8] The human factor itself includes two main sub-factors; driving skills and driving style.^[9] Driving behavior situation is related to personal habits of individuals in driving, such as the way the person chooses for driving. Driving style is achieved owing to long-term driving, but the experience of long-term driving could not be the reason for safer driving while the longer driving could increase the skill levels of drivers and indicate safer driving.^[9]

In this study, the assessment of general driving behavior was obtained using the driver behavior questionnaire (DBQ),^[10-12] DBQ was compiled in 1990 in Manchester University by Reason *et al.*, 1990.^[10]

Despite small differences existing between the theoretic structure of the four constructive subscale of driving behaviors used in different countries, the accuracy and verification of the general structures of four subscale have been examined and approved in various studies.^[7,13] For further analysis of driving behaviors, previous distinctions were adopted, between three classes of behaviors within the DBQ: Errors, lapses and violations;^[10] Originally, Reason *et al.* (1990) identified three factors within the DBQ lapses, violations and errors. Lapses were defined as absent-minded behaviors, which usually do not pose any threat to road users. Violations were defined as deliberate departures from behaviors believed to represent safe driving practices; errors were defined as failures of observation that may be hazardous to others. Errors also included planned actions that fail to accomplish their intended outcomes.

This scale was used in different countries such as England,^[14] Australia,^[15] china,^[16] Finland.^[17]

In a study on 1000 Australian drivers, It was determined that there is no relationship between anxiety and high risk driving behaviors.^[18] In another study, it was determined that there is a clear relationship between high level systemic anxiety and dangerous driving. In recent studies such as: Shahar in 2009 and study on trait anxiety (TA), it was determined that high level anxiety in drivers result in high risk behaviors, which interpreted into

this fact that anxiety disturbs mental process and function.^[11,19]

DBQ is one of the important instruments with a wide dimension to study driving style and relationship between driving behavior and accidents.^[10,17,20] DBQ was used to a meta behavior study to predict the accidents with regard to both errors and violation factors, which its conclusions generally showed that correlation between violations and accidents prediction and correlation between errors and accident prediction is equal.^[21]

The aim of this study is analyzing the relations between levels of TA with subscale of driving behaviors and distinguish dominant driver behavior factor in drivers having a crash in Iran and this study was compiled and fulfilled with regards to very few studies performed about driving behaviors and TA of drivers and the relations between these two variables in Iran.

METHODS

Participants

This study conducted on 168 drivers included 26 females and 142 males (with the mean of 29 years old standard deviation of 6.68 [SD = 6.68] range of 19-48 years old). All these participants had a driving license. These people were guilty in driving accidents that injured in an accident and referred to traffic police to draw the layout and participated in this study voluntarily. It noted that all these committed drivers were loosed financially, but none of them was injured physically.

Measures

Driver behavior questionnaire

The applied instruments in this study are the most common DBQ of DBQ, which involved four behavior subscales and consisted of two major groups: Violations (ordinary and aggressive) and mistake that consisted of lapses and errors. For each of the four subscale of the DBQ by Gras *et al.*, to be 82%, 66%, 59% and 81% for errors, lapses ordinary violations and aggressive violations, respectively.^[22]

In the study by Oraizi and Haghaigh, DBQ was translated and for obtaining the reliability and intra-class correlation coefficients of

different subscale, 293 drivers, who had high reliability (uniformity coefficient) among Iranian driver were examined. The coefficients include: Lapses (0.77), errors (0.81), aggressive violations (0.86) and ordinary violations (0.65).^[23]

This questionnaire consisted of 50 different questions in four section and answers of questions were scaled in 0-5 scores (never = 0, hardly = 1, occasionally = 2, mostly: 3, frequently = 4, always = 5). The highest score in each section is obtained from four parameters that determine the drivers prevailing behavior. These questions are different in two aspects: Behavior type and its harmfulness levels for others. Harmfulness levels of these behaviors classified in tree groups: (a) Behaviors with no risk contingencies for the other drivers on the road to the extent of making the inconvenience feelings for others (low risk contingency); (b) Behaviors that may provide hazards for others (intermediate risk contingency); and (c) Behaviors certainly endanger other drivers (high risk contingency).

Spielberger state-trait anxiety inventory

Another tool in driving styles is Spielberger state-trait anxiety, both types of anxiety involve 40 questions that 20 questions are related to state anxiety and 20 questions are about TA.^[24] This questionnaire has the Likert scale and its divisions include “almost never” with grade “1” to “almost always” with grade “4.” This questionnaire was used in the research by Panahishahri, in Iran and had high intra-class correlation coefficients and the average reliability ratio in different groups was reported to be 92% for the state anxiety and 90% for TA measures.^[25]

Place of execution

The standard Manchester DBQ for Iranian drivers completed in investigation department of Isfahan traffic police accidents by accident drivers loosed financially. These people waited to investigate in their accident cases.

Statistical analysis

The applied statistical tests in this study to discuss conclusions were included: Independent *t*-test, one-way analyses of variance (ANOVA), Pearson correlation test.

RESULTS

Independent *t*-test in Table 1 shows that mean scores for two subscale of violation (ordinary and aggressive) is higher and mean score of errors subscale in men was significantly higher than women, but other subscale of DBQ mean scores between two genders was not significant.

Relation between DBQ and TA with age, daily work hours and driving experience

The mean scores (standard deviation) for driving experience (year) and daily work hours was 7.5 (5.36 year) and 8.41 (2.31 h). Table 2 shows the correlation between subscale of DBQ and TA with age, driving experience, daily work hours. Pearson correlation revealed that between subscale of DBQ and TA scores had a significant positive relation with all the DBQ subscales and this point is notable that errors and lapses had higher relation with TA than violation subscale Table 2.

Table 2: Pearson correlation between subscale of DBQ and TA with age, driving experience and daily work hours

DBQ and TA	Trait anxiety	Age	Daily work hours	Driving experience
Aggressive	0.174*	-0.274**	0.142*	-0.197**
Ordinary	0.150*	-0.159*	0.053	-0.104
Lapses	0.209**	-0.155*	0.070	-0.086
Error	0.229**	-0.081	0.027	-0.083
TA	-	0.007	0.227**	-

* $P < 0.05$, ** $P < 0.01$. DBQ=Driving behavior questionnaire, TA=Trait-anxiety

Table 1: Mean score and standard deviation, DBQ and TA by sex

DBQ and trait anxiety	Men		Women		Total (men and women)		
	Mean	SD	Mean	SD	Mean	SD	<i>P</i> value
Aggressive violation	20.54	12.69	15.97	13.44	19.83	12.88	0.097
Ordinary violation	23.23	15.95	17.69	15.04	22.38	15.90	0.102
Lapse	17.36	8.23	15.55	7.68	17.08	8.15	0.321
Errors	14.02	9.84	9.82	6.16	13.37	9.47	0.038*
Trait anxiety	37.92	14.80	38.57	20.08	38.01	17.25	0.857

* $P < 0.05$, DBQ=Driving behavior questionnaire, TA=Trait-anxiety

Furthermore, Pearson correlation shows that age had a significant negative relation with three subscale of DBQ (lapses, aggression and ordinary violation), but errors subscale had a weaker correlation that was not significant. Driving experience had negative relation with all the DBQ subscales, but this point is notable that driving experience had a significant negative relation with aggressive violation. Daily work hours had a positive relation with all subscale of DBQ, but this point is notable that daily work hours had a significant direct positive effect on aggression violation subscale. Another noteworthy relation was the significant direct positive between daily work hours and TA among drivers having crash Table 2.

Difference mean scores between three levels of TA

Finally, the sample was split on the basis of anxiety scores into three anxiety groups of low-, medium- and high-TA (LTA, MTA and HTA). The mean TA scores for the LTA ($n = 58$), MTA ($n = 98$) and HTA ($n = 12$) groups were 20.74 (SD = 8.03), 40.01 (SD = 8.79) and 41.770.33 (SD = 3.20), respectively. ANOVAs for each dependent variables, DBQ, errors, lapses, ordinary violations and aggressive violations had a significant different ($P < 001$).

According to Table 3, with increasing anxiety from LTA to HTA all of the DBQ subscales have increased that only ordinary violation was significant.

DISCUSSION

Behavior of drivers is quite complicated during driving and no researching analysis could cover all its complications. Nevertheless, since questionnaires such as DBQ are issued according to a strong theory, it is at present one of the most useful tools in driving behavior.^[21]

The important point obtained according to the studies about driving behavior and its establishing principles is that no similar and absolute driving behaviors could be observed among the drivers in different countries of the world that could be due to different dependent principle factors, which include the existing social and cultural differences among the people in different parts of the world.^[10]

The results of this study show that ordinary and aggressive violations, lapses and finally error have most of the shares, respectively in driving behavior of the Iranian drivers having crash. Like northern European and Scandinavian countries, especially Finland^[26] and with according to the meta analysis by (de Winter 2010) violations were predictor of accidents among young driver than older drivers.^[27]

The other considerable point in the study is the higher mean scores of each basis in driving behavior in men as compared with women that indicate that women perform less aberrant behaviors than men this shows that women are considerably act safer than men and admit less risks consist with the previous finding.^[27]

The second aim of this study is analyzing the effects and relation rates of TA (state of trait anxiety is a sentimental state or the feeling of fear, worry and distress usually accompanied by moving or physiological reactions and physiological signs are followed by high heart rate, anxiousness, asthma, etc.),^[28] in emergence of any of driving behaviors subscale (DBQ).

The regression shows that TA had a significant direct effect on all of the DBQ subscale especially on errors and lapses that this results verifies the matter regarding anxiety as a negative and destructive psychological problem on driving behavior; especially (errors owing to lack of attentions and mental concentrations and lapses due to lack of attentiveness) and its reason is

Table 3: Means by the (LTA), (MTA) and (HTA) groups on the dependent variables, for the 3×(LTA, MTA and HTA) ANOVA

DBQ	LTA		MTA		HTA		F
	Mean	SD	Mean	SD	Mean	SD	
Aggressive violation	18.67	12.68	19.93	12.70	31.38	15.78	2.28
Ordinary violation	20.34	15.21	22.47	14.52	44.00	33.61	5.36**
Lapse	15.48	6.58	18.03	8.91	18.81	5.40	1.90
Errors	11.53	7.50	14.17	9.98	17.77	16.25	2.04

* $P < 0.05$, ** $P < 0.01$. HTA=High-test-anxious, MTA=Medium threat areas, LTA=Low threat areas, DBQ=Driving behavior questionnaire

the destructive effect of anxiety on appropriate mental and psychological functions in drivers that subsequently causes disorders in decisions made and proper mental processing of drivers for proper and correct performance that would be expected by cognitive interference theory.^[29] The linear effects are consistent with studies that have found general adverse effects of anxiety on performance effectiveness,^[30-32] processing efficiency theory;^[33] this suggests that worries occupy the processing capacity of working memory, resulting in information-processing overload at the expense of the task to be performed. As well as adverse effects of anxiety on driving performance in particular.^[19,34,35]

The results of the study is verification of the matter that by increasing the TA level from the low level toward the medium and high levels, the mean scores of the four constructive basis for behavior have been ascending that indicates the negative effect of high levels in the emergence of aberrant behaviors of the drivers.^[19] It can be inferred that the drivers with higher levels of TA are more susceptible to aberrant behavior or having accidents than the drivers with lower levels of TA.^[19] In addition to the mentioned relations, the positive and significant correlation relations could be stated between TA and violations, especially the obtained aggressive violations.

According to the positive relations between TA and ordinary and aggressive violation can concluded that the increment in ordinary violations as a function of TA may well-reflect the same mechanism that was used to explain the differences as far as errors and lapses. Specifically, although high-anxious individuals do not intend to violate traffic laws, they do so more frequently than low-anxious individuals do due to inattention, which results from cognitive overload also one might expect that anxious individuals would be more afraid of being involved in car accidents, of violating laws in general and of law enforcement officers in particular. In fact,^[29,30] it can generally be stated that aggressive violations involve the non-personal part of the aggressive behavior of drivers that is due to inattention to driving regulations and short time in developing behavioral culture in observing the regulations.^[26] It can be realized that the rate of anxiety might be regarded as a reflection of high level of aggression in drivers admitting risks.^[32]

The Pearson correlation revealed that age had a significant negative effect on all DBQ subscale except error that was not significant similar to the meta-analysis of the relationship between the DBQ factors and age and exposure revealed that violations and to a lesser extent errors, reduced with age,^[27] the rate of dangerous behaviors reduced with regards to constructive bases of driving behavior and with respect to the following priorities: Aggressive violation, ordinary violation, error and finally lapses and it can be inferred that by increasing age and driving experience,^[28] the drivers emotional driving is reduced and older drivers would gain higher knowledge and drive safer with more realistic views from later consequences of dangerous driving that could be accidents. It was reported in a study that women and the elderly people have less inclination to violations during driving than young people. On the other hand, women and the elderly people are more susceptible to making errors than young people and younger people as well as men are more inclined to infringements.^[36] Safer driving in older drivers as compared with the younger ones indicates increasing the level of traffic culture in these people.^[27]

Finally according to significant result present study can conclusion that numerous of cognitive factors such TA and state anxiety singly and combination each other have a destructive effect on driver behavior and when this two cognitive combination each other have stronger inappropriate effect on driver behavior.

CONCLUSIONS

Since driving behavior requires continual analysis from the obtained information regarding vehicles (speed, moving direction, acceleration, determining the moving route, reaction time for braking, etc.) and the environment (traffic, road conditions, climatic conditions, area lighting, viewing distance, predicting the other driver's behaviors, etc.) anxiety as a destructive factor has shown that all the above functions are deficient, such that in some cases it has led to accidents. In a more prevalent state, it has led to "near miss" condition. Since the rates of accidents and mortalities due to driving is higher than the expected average, any intervention for evaluation

and determining worried drivers for reducing the emergence of the errors leading to accidents is justifiable and could be invested upon.

Therefore, pay more attention to the affecting psychological factors (i.e., TA and state anxiety) in supplementary study in the future is essential.

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