

Study on Unsafe and Aggressive Driving Behaviors of Light Passenger Vehicle Drivers in Dhaka City

Dr. Farzana RAHMAN ^a, Tanweer HASAN ^b, Surajit SAHA^c

^a *Department of Civil Engineering, University of Asia Pacific, Dhaka-1205, Bangladesh*

^a *E-mail: farzana_rahman2002@yahoo.com*

^{b,c} *Department of Civil Engineering, Department of Civil Engineering, BUET, Dhaka-1000 Bangladesh*

^{b,c} *Same as the first author; E-mail: farzana_rahman2002@yahoo.com*

Abstract: Aggressive driving is a major concern of all over the world. Aggressive driving occurs when individual executing a combination of moving traffic violations so as to endanger other persons or property. Investigating aggressive driving behavior is essential since such behavior has been exhibited to be main cause of traffic accidents. The objective of this research is to identify light passenger vehicle drivers' perception about unsafe and aggressive driving behavior. A questionnaire survey was conducted in Dhaka city to light passenger vehicle drivers' for investigating their involvement in unsafe and aggressive driving related behaviors, their method of employment, method of appointment and salary situations along with their professional characteristics, and skills. Result shows symptoms of potentially aggressive driving behaviors as race another driver, weaving in and out, failing to yield, and driving inattentively. Analyzing aggressive driving behavior, its contribution to traffic accidents can help design programs to reducing such driving behavior.

Keywords: Aggressive driving, accidents, unsafe, light passenger vehicle.

INTRODUCTION

Road safety in Bangladesh has been rapidly deteriorating; this is amply manifested in the number of road accident deaths, largely as direct consequences of rapid growth in motorization, urbanization and population. Statistics (National Road Safety Council, 2011-2013) reveals that Bangladesh has one of the highest fatality rate in road accidents – more than 85 deaths per ten thousand registered motor vehicles every year. Whereas, in developed countries the number of motorized vehicles is many times more, the rate is below 5. Main causes of road accidents are over speeding, overloading, and overtaking by motor vehicles. Unregulated movement of non-motorized vehicles along with motorized vehicles on the same route is also one of the major causes for road accidents. About 4,000 deaths are reported each year; the actual fatality rate may be much higher than that. Road accidents cost the nation around taka 5,000 cores per year and they mostly affect the rural poor more than any other demographic group. These findings clearly suggest the acute urgency of the need to address the problems of traffic accidents for improving road safety in Bangladesh by implementing a technically and cost effective road safety policy and programs in a coordinated and integrated manner.

Aggressive driving behavior is defined as behavior performed while driving that is intended to cause physical or psychological harm to any sentient being (Dula and Geller, 2003). This can involve tailgating, horn blowing, flashing headlights, cutting in and out, swearing and hostile gestures, as well as threatening and assaulting other drivers. Such behaviors are increasingly present on our roads. Between 1996 and 2000, reported cases of

aggressive driving behavior increased by a factor of 15 in Canada (Smart and Mann, 2002) and in the U.S. (James and Nahl, 2002). Studying aggressive driving behavior is important for a number of reasons. Considering safety standpoint, aggressiveness has been shown to be a major cause of traffic accidents (AAA Foundation for Traffic Safety, 2009). Analyzing aggressive driving behavior, its contribution to traffic accidents can help design programs to reducing aggressive driving behavior.

Accident Research Centre (2004), Bangladesh University of Engineering and technology found that drivers, when describing their personal experience about the accidents in which they were involved were due directly to vehicular failure or mechanical faults of vehicles, aggressive overtaking maneuver of the trailing drivers and, most importantly, due to the unexpected behavior of the pedestrians. 76% of the drivers expressed the reasons for over-speeding tendencies is the intention to reach earlier to their destination with perishable products within the stipulated time boundary as the primary reason for their over-speeding behaviors and over-speeding tendency made them drive aggressively which they considered as the most important reason for accidents. The objective of this research is to identify light passenger vehicle drivers' perception about unsafe and aggressive driving behavior.

This paper describes the findings focusing on drivers' aggressive driving habits, their perception of road safety and their opinions about the causes of unsafe and aggressive driving. This research also focuses aggressive driving characteristics of light passenger vehicle drivers' towards road safety, the circumstantial factors for their involvement in unsafe and aggressive driving related road traffic accidents, their method of employment, method of appointment and salary situations as well as their professional characteristics, skills, capabilities and limitations by conducting a comprehensive questionnaire survey in Dhaka City.

LITERATURE REVIEW

Aggressive driving is manifested through a combination of willful traffic offenses or unsafe driving behaviors such as running red lights, traffic weaving, tailgating, or forced merging (National Highway Traffic Safety Administration, 2011; Neuman et al., 2003; Tasca, 2000). It is seen as any driving behavior stimulated by impatience/time pressure, frustration, or anger that psychologically and physically endangers others (Shinar, 1998). Mizell (1997) defined aggressive driving as an incident in which an angry or impatient motorist or passenger intentionally injures or kills another motorist, passenger or pedestrian or attempts to injure or kill another motorist, passenger or pedestrian, in response to a traffic dispute, altercation or grievance. This definition focuses exclusively on behavior intended to physically harm, or indeed, fatally injure another road user. Leo Tasca (2000) suggests that a more precise definition of aggressive driving would focus on deliberate and willful driving behaviors that while not intended to physically harm another road user show disregard for their safety and well-being.

The American Automobile Association (AAA, 2009) defines aggressive driving as the operation of a motor vehicle without regard to others' safety. The AAA definition also excludes behaviors associated with road rage, which is defined as "assault with the intent to do harm arising from the use of a motor vehicle (Goehring, 2000).

A focus group study conducted in the Washington D.C. area indicates that drivers who think of themselves as aggressive certainly drove at speeds faster than the general driving population (NHTSA, 1998a). The general consensus among all participants was that "excessive speed" is an action which should be included in a definition of aggressive driving.

Driving at excessive speeds, at least occasionally, was reported by about two-thirds of respondents to a nationwide NHTSA survey on aggressive driving behavior. These drivers reported exceeding what they consider to be the maximum safe speed on roads they regularly travel (NHTSA, 1998b). It is important to note that these drivers are not reporting exceeding the posted limit, but rather exceeding the limit which they perceive to be safe on a given road. This review suggests aggressive driving as a driving behavior which is deliberate, likely to increase the risk of collision and is motivated by impatience, annoyance, hostility and/or an attempt to save time.

Kaysi and Abbany (2007) modeled aggressive driving behavior at un-signalized intersections in Beirut. They observed gap acceptance and merging at U-turns and developed a probit model that predicts the probability that a driver merges in an aggressive manner. They found that age, car performance, and average speed of the major traffic were important predictors of aggressive merging maneuvers.

Choudhury (2007) estimated models of freeway lane changing using disaggregate trajectory data without driver-related data. Driving aggressiveness was modeled as a random variable and included in a target lane choice model. The estimation results indicated that compared to timid drivers, aggressive drivers are less likely to choose the right lane over the left lane.

Paleti et al. (2010) modeled the effect of a number of variables on injury severity in traffic crashes through the moderating effect of aggressiveness. Using a US database of crashes, their measure of aggressiveness was based on the determination of a group of trained researchers who classified a crash as involving aggressive behavior or not. Using structural equation modeling, they found that a number of factors affect driving aggressiveness, including driver characteristics (such as gender, age, seat belt usage, etc.), environmental and situational factors (such as time of day, weather, and company in the car), vehicle characteristics (such as type of vehicle), and roadway characteristics (such as speed limit). They also found that aggressiveness impacted the severity of injuries in crashes.

Several studies measured driving aggressiveness, including the driving anger scale (Deffenbacher et al., 1994) whereby respondents rate the degree of anger they would experience if faced with certain driving situations; the aggression questionnaire (Buss and Perry, 1992) whereby respondents rate several statements that measure to what extent they are aggressive (in general) by nature; and other questionnaires that measure aggressive driving attitudes and the self-reported frequency of certain aggressive driving behaviors (Miles and Johnson, 2003).

Al-Shihabi and Mourant (2003) presented a conceptual framework for making the driving patterns of autonomous vehicles within a simulator more realistic; they implemented models in the simulator that can represent various types of driving behavior, including aggressive driving. Cai et al. (2007) demonstrated drivers' performance and physiological reactions with a simulator.

Philippe et al. (2009) examined the relationship between "obsessive" passion for driving and aggressive driving behavior using a driving simulator. They used both self-reported measures of aggressive driving behavior and observed measures based on judges' evaluations of the reactions of the subjects undergoing the simulator experiments. They found correlations between obsessive passion for driving and aggressive driving behavior when subjects are instigated to drive aggressively in the simulator, as well as a mediating effect of anger in the passion-aggressiveness relationship.

Other studies have examined the extent to which driving aggressiveness is a trait (Lajunen and Parker, 2001), or the extent to which self-reported driving aggressiveness is a predictor of self-reported car crashes (Chliaoutakis et al., 2002).

Past research on aggressive driving behavior has basically looked at how anger can predict aggressive driving behavior, especially under frustrating conditions (Deffenbacher, et al., 1994; Galovski and Blanchard, 2002; James and Nahl, 2000; Naatanen and Summala, 1976; Shinar, 1998; Philippe et al. 2009). Furthermore, such research has looked at the relationship between aggressive driving behavior and some individual differences, such as trait anger (e.g., Deffenbacher, Deffenbacher, Lynch, & Richards, 2003) and susceptibility to driving stress (James and Nahl, 2000).

STUDY DESIGN AND METHODOLOGY

A face-to-face interview survey was conducted at randomly selected parking lots located strategically throughout the Dhaka City. The questionnaire consisted of thirty three questions which were divided into four sections. Section one consisted twelve questions about personal information, section two contained five questions about driving hours and methods of employment and payment, section three contained fourteen questions about drivers' habits and section four comprised two questions about drivers' opinion.

A sample of five hundred drivers was selected. The questionnaire survey was aimed at covering drivers at major official parking lots, taking into consideration that they mostly represent the light passenger vehicle drivers especially for leguna and CNG auto rickshaw. The sample group was distributed proportionally at different parking lots located throughout the whole Dhaka City. 18 locations were selected for the survey. The survey was conducted when the drivers were taking rest in the parking lots after morning duty. The survey was carried out for seven days in February 2013. Each individual questionnaire was uniquely identified by a number of codes. This code was transferred to all computer records that were produced from the questionnaire.

DATA ANALYSIS AND RESULT

Sample Characteristics

The demographic characteristics of the participants are presented in Table 1 and Table 2. The greatest number of drivers (nearly 50%) belongs to 20-30 years age group having primary school education level. Most of the drivers having 1 to 5 years or 6 to 10 years driving experience while majority (86%) of them are married. 73 percent of the drivers said that they usually suffer from a sense of insecurity and feeling of losing their jobs any time without any prior notice.

The drivers were asked whether or not they have any physical problem that might affect them while driving. It is interesting to note that almost all the drivers (98%) feel that they do not have any physical problem. The drivers were asked whether they wear glasses while driving. It is interesting to note that most of the drivers (76%) never wear glasses and 9% of drivers sometimes wear glasses whereas only 15% of drivers always wear glasses.

Table 1. Demographic characteristics of drivers (N = 500)

		Number of drivers	% of drivers
Age Group	< 20	0	0.0
	20-30	248	49.6
	31-40	169	33.8
	41-50	65	13.0
	51-60	16	3.2
	61-70	2	0.4
	> 70	0	0.0
Driving Experience	1-5 Years	134	26.8
	6-10 Years	137	27.4
	11-15 Years	102	20.4
	16-20 Years	60	12.0
	21-25 Years	34	6.8
	26-30 Years	22	4.4
	> 30 Years	11	2.2
Marital Status	Married	430	86.0
	Unmarried	70	14.0
Education Level	No Formal Education	53	10.6
	Primary School	251	50.2
	High School	165	33.0
	College	18	3.6
	Graduation	6	1.2
	Post-Graduation	7	1.4
	Trade/Technical Course	0	0.0

Table 2. Socio-economic characteristics of drivers (N = 500)

		Number of drivers	% of drivers
Family monthly income (Tk)	5,000-10,000	39	7.8
	10,000-15,000	262	52.4
	15,000-20,000	90	18.0
	20,000-25,000	70	14.0
	25,000-30,000	14	2.8
	Over 30,000	25	5.0
Mode of payment	Monthly Payment	392	78.4
	Daily Basis	20	4.0
	Contractual	74	14.8
	Trip Basis	0	0.0
	Others	14	2.8
Method of employment	Regular	392	78.4
	Irregular	20	4.0
	Contractual	74	14.8
	Others	14	2.8
Method of appointment in job	Written	118	23.6
	Verbal	365	73.0
	Others	17	3.4

Licensing Status of Drivers

The respondents were asked about the type of their valid driving licenses. According to their answer, 98% of the drivers were found to possess professional driving licenses while the remaining interviewees were found to have nonprofessional/amateur driving licenses. 100% of the drivers were found to possess valid and original driving licenses. The drivers were asked about the experience of their valid driving licenses. Result shows that the drivers had less than ten years' (54%), more than ten years' (35%), more than twenty years' (9%), and more than thirty years' (2%) experience valid driving licenses. Result shows that nearly 72%

of the interviewed drivers usually get their licenses through the Bangladesh Road Transport Authority (BRTA) by appearing at fair driving examination. A considerable number of drivers (23%) obtained their licenses by illegal means through some scrupulous agents and only about 5% of the drivers stated that they got their driving licenses through driving training institute after formal training.

Types of Driving Vehicles

The participants were asked about the type of their vehicle. According to their answer, 52% of the drivers were found to drive car while the remaining drivers were found to drive light vehicles. The details of distribution of drivers according to types of driving vehicles are shown in Table 3.

Table 3. Types of vehicles driven by the respondents (N = 500)

Types of Driving Vehicles	Number of drivers	% of drivers
Micro Bus	88	18
Jeep	59	12
Pick-up	9	2
Car	264	52
Leguna	41	8
CNG Auto Rickshaw	39	8

Drivers' Fatigue or Illness While Driving

In order to understand fatigue related behaviors of drivers, respondents were asked two questions as "How often do you drive?" and "Do you drive in fatigue or illness?" Drivers' responses demonstrate that driver's average driving schedule was found approximately to be 8-10 hours in a day whereas many of them drive for as long as 16 hours even. About 97% of the drivers stated that they have to drive more than 8-10 hours a day at a stretch under pressure while conditions arose or their employer asked for it while 1.8% of them stated that they drive few days a week, and about 0.4% stated that they drive few days a month and about 1% stated that they drive few days a year. About 26% of the drivers stated that they have to drive in fatigue or illness under pressure when conditions for such driving arose or their employer asked for it while 74% of them stated that they never drive in fatigue or illness. 23.8% of the drivers stated that they drive sometimes in fatigue or illness.

Drivers' responses about driving in fatigue or illness were categorized as age groups. It was found that 20-40 years old drivers have more tendencies to drive in fatigue or illness and this tendency turned out to be less with the increase of drivers' age. Drivers' responses about driving in fatigue or illness were categorized as drivers' experience. It was found that, 1-5 years' and 16-20 years' experienced drivers have more tendencies to drive in fatigue or illness and this tendency turned into less with the increase of drivers' experience. Drivers' responses about driving in fatigue or illness were categorized as drivers' education. It was found that, drivers having primary and high school education have more tendencies to drive in fatigue or illness and this tendency turned out to be less with the increase of drivers' education. Drivers of 10-20 thousand taka family monthly income have more tendencies to drive in fatigue or illness and this tendency turned into less with the increase of income. It was found that, car and jeep drivers have more tendencies to drive in fatigue or illness.

Drivers' Attitude towards Driving (in Heavy Traffic) and Overtaking

The participants were asked about their driving habit in heavy traffic. Responses from the

interviewed drivers can be summarized as: only 8% of the drivers usually keep with faster traffic, whereas 19% usually stay with slower traffic and rest 73% of the drivers keep both with faster traffic and slower traffic in different driving situation whenever it is necessary.

The participants were asked about their driving habit during overtaking. Result reveals that 77% of the drivers stated that they pass other vehicles and other vehicles pass them both in different traffic condition whenever it is necessary. 9% of them usually pass other vehicles more often. The details are depicted in Figure 1.

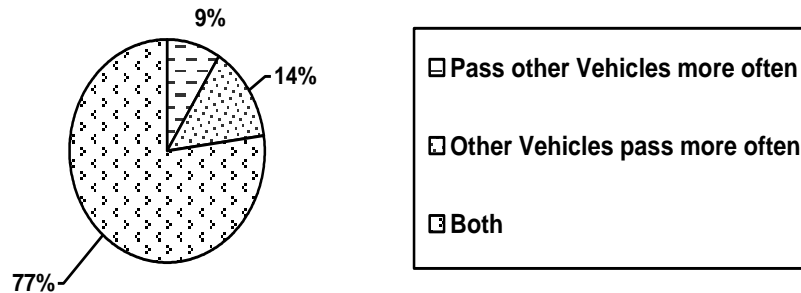


Figure 1. Drivers' driving habit during overtaking

Drivers' Average Driving Speed

The participants were questioned about their average driving speed. Most of the drivers do not know about driving speed limit in the city. During the survey the average driving speed was not mentioned. So, they were very conservative about their answer. They thought that over speeding may cause unsafe and aggressive driving which is the violation of traffic rules. The respondents who answered that their average speeds are at the limit also have no clear idea about the speed limit in the city. Result shows that nearly 40% of the interviewed drivers usually follow speed limit while driving and only 2% of them usually drive much faster than the speed limit while driving.

Drivers' responses about average driving speed were categorized as age groups. It was found that, 20-30 years old drivers' average driving speeds are at the limit or little faster than the limit. The details are summarized in Table 4.

Table 4. Average driving speed with respect to age groups

Age of Drivers	Average Driving Speed in the City				
	Much slower than the limit	Little slower than the limit	At the limit	Little faster than the limit	Much faster than the limit
20 years to 30 years	39	27	97	80	5
31 years to 40 years	23	47	69	29	1
41 years to 50 years	19	7	32	5	2
51 years to 60 years	7	2	6	1	0
61 years to 70 years	1	0	1	0	0
More than 70 years	0	0	0	0	0

Average driving speed with respect to drivers' experience

Drivers' responses about average driving speed were categorized as drivers' experience. It was found that, 1-15 years or 6-10 years experienced drivers' average driving speeds are at the limit and 6-10 years experienced drivers are little faster than the limit. The details are summarized in Table 5.

Table 5. Average driving speed with respect to drivers' experience

Driving Experience	Average Driving Speed in the City				
	Much slower than the limit	Little slower than the limit	At the limit	Little faster than the limit	Much faster than the limit
1 year to 5 years	29	11	56	36	2
6 years to 10 years	13	19	52	52	1
11 years to 15 years	20	23	45	11	3
16 years to 20 years	4	23	24	9	0
21 years to 25 years	9	5	14	4	2
26 years to 30 years	8	1	10	3	0
More than 30 years	6	1	4	0	0

Relationship between Driving and Disobeying Traffic Rules

Drivers' attitude towards driving and disobeying traffic rules is measured by asking the respondents how often they are stopped by police. Drivers' responses revealed that nearly half of the interviewed drivers stopped by police few times a year, 34% of them never stopped by police, and only about 1% of the drivers stopped by police almost every day. About 8% of the drivers usually stopped by police several times a week and rest 5% several times a month.

Drivers' responses about police interrogation were categorized as age groups. It was found that, 20-40 years old drivers stopped by police almost every day or several times a week. This practice becomes fewer with increase of drivers age. The details are summarized in Figure 2.

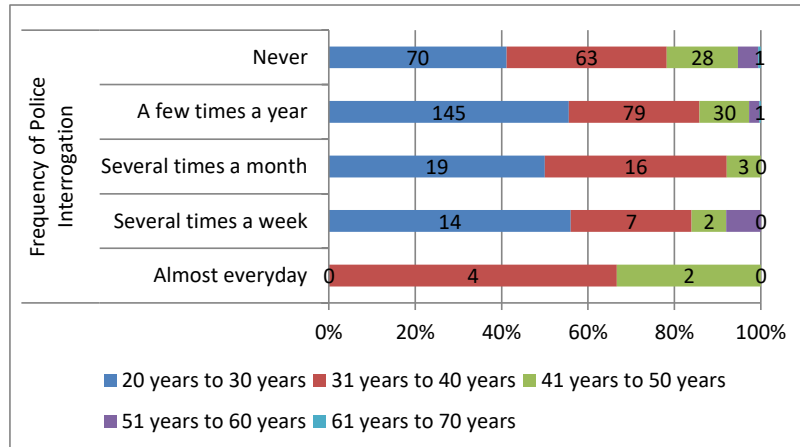


Figure 2. Drivers' attitude towards driving and disobeying of traffic rules

Drivers' responses about frequency of police interrogation were categorized as drivers' experience. It was found that, 6-20 year's experienced drivers stopped by police almost every day or several times a week. This practice becomes less with the increase of drivers' experience. It need be mentioned that the drivers' responses may be somewhat conservative while stating their personal habitual activities under different driving situations.

Adhere to Speed Meter of Drivers'

Drivers' responses about adhering speed meter were categorized with respect to drivers' experience as shown in Table 6. It was found that, mostly 6-15 years experienced drivers

follow speed meter always.

Table 6. Adhering Speed Meter with respect to Drivers' Experience

Driving Experience	Following Speed Meter While Driving		
	Always	Never	Sometimes
1 year to 5 years	31	49	54
6 years to 10 years	53	38	46
11 years to 15 years	58	26	18
16 years to 20 years	43	3	14
21 years to 25 years	8	18	8
26 years to 30 years	10	5	7
More than 30 years	2	5	4

Drivers' responses about following speed meter were categorized as drivers' education. It was found that, drivers having high school education mostly follow speed meter always. Drivers' responses about following speed meter were categorized as types of vehicle. It was found that, car and micro bus drivers generally follow speed meter always.

Follow of Traffic Signs/Signals of Drivers

Drivers' responses about following traffic signs/signals were categorized as age of drivers. It was found that, 20-30 years old drivers always follow traffic signs/signals. The details are summarized in Table 7.

Table 7. Following Traffic Signs/Signals with respect to age

Age of Drivers	Following Traffic Signs/Signals While Driving		
	Always	Never	Sometimes
Less than 20 years	0	0	0
20 years to 30 years	176	3	69
31 years to 40 years	146	0	23
41 years to 50 years	59	0	6
51 years to 60 years	12	0	3
61 years to 70 years	2	0	0
More than 70 years	0	0	0

Drivers' responses about following traffic signs/signals were categorized as drivers' experience. It was found that, 1-10 years experienced drivers never follow traffic signs/signals. Drivers' responses about following traffic signs/signals were categorized as drivers' education. It was found that, some drivers having primary education never follow traffic signs/signals.

Wearing Seat Belt of Drivers

Drivers' responses about wearing seat belt were categorized as age of drivers. It was found that, 20-30 years old drivers always wear seat belt. The details are shown in Table 7. Drivers' responses about wearing seat belt were categorized as drivers' education. It was found that, some drivers having either primary or high school education never wear seat belt. Drivers' responses about wearing seat belt were categorized as types of vehicle. Almost all the leguna

and CNG auto rickshaw drivers never wear seat belt.

Table 7. Wearing Seat Belt with respect to Age Groups

Age of Drivers	Wearing Seat Belt While Driving		
	Always	Never	Sometimes
Less than 20 years	0	0	0
20 years to 30 years	173	69	6
31 years to 40 years	147	19	3
41 years to 50 years	62	2	1
51 years to 60 years	14	2	0
61 years to 70 years	2	0	0
More than 70 years	0	0	0

Drivers' Opinion

In the next section an attempt was made to obtain drivers opinions on various issues like feelings of their own driving, symptoms of aggressive driving, and causes of aggressive driving.

Drivers' feelings about their own driving

Drivers were asked about the feelings of their own driving. 89% of the drivers stated that, they always try to follow traffic rules which indicate safe driving. 58% expressed that, if they drive faster they become more alert indicating safe driving. 44% indicated that, they always keep in mind that other drivers may make mistake and drive carefully which indicates defensive driving and 37% stated that, they worry a lot about having a crash while driving which indicates safe driving. So it can be said that 21% drivers are considerably unsafe and 67% drivers are considerably aggressive. Details of this can be seen in Table 8.

Table 8. Drivers' feelings about own driving

Feelings About Own Driving	% Response	Indicates
a) I enjoy the feelings of speed	21.4	Unsafe/Aggressive Driving
b) The faster I drive, the more alert I am	58.0	Safe Driving
c) I often get impatient with slower driver	20.4	Aggressive Driving
d) I try to get where I go as fast as I can	25.0	Aggressive Driving
e) I worry a lot about having a crash	37.2	Safe Driving
f) I always try to follow the traffic rules	89.2	Safe Driving
g) I always keep in mind that other drivers may make mistakes and drive carefully	43.8	Defensive Driving
h) Others	5.0	

Drivers' feelings about their own driving with respect to age and experience

Drivers were asked about the feelings of their own driving. Summary of the results with respect to driving experience shows that 26% among all drivers having 6-10 years' experience always try to follow the traffic rules as they feel about their own driving. 23% of them stated if they drive faster they become more alert. So, 23% of 1-5 years experienced drivers' are considerably aggressive on the other hand 5% of 1-5 years and 6-10 years experienced drivers' driving is considerably unsafe. Details of this can be seen in Figure 3.

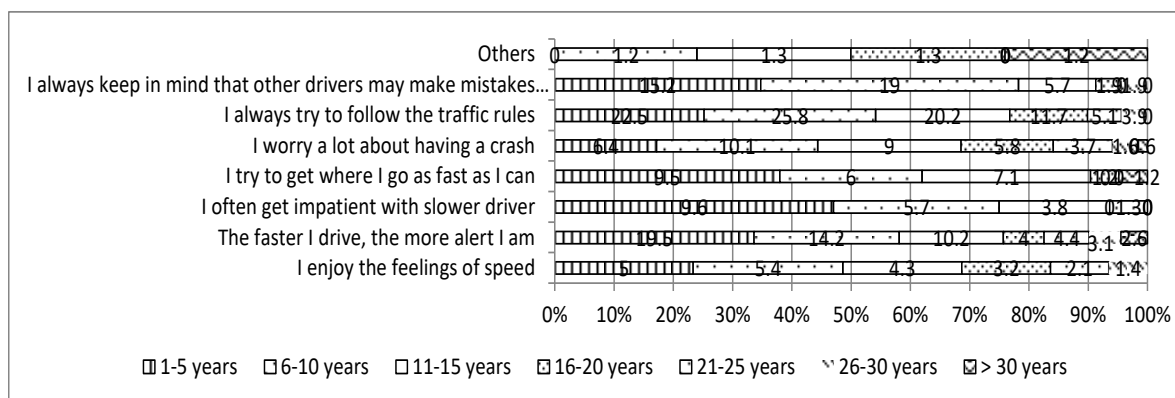


Figure 3. Drivers' feelings about own driving with respect to drivers' experience

Drivers' feelings about their own driving with respect to drivers' education

Drivers were asked about the feelings of their own driving with respect to drivers education illustrates that a significant number driver (43% among all the drivers) who has primary school education always try to follow the traffic rules as they feel about their own driving. Another significant number driver (36% among all the drivers) who has primary education stated if they drive faster they became more alert and a considerable number driver (32% among all the drivers) who has high school education stated that they always try to follow the traffic rules. Hence 39% primary school educated drivers' driving is considerably aggressive on the other hand 11% primary school educated drivers' driving is unsafe. Details of this can be seen in Table 9.

Table 9. Drivers' Feelings about own Driving with respect to drivers' education

Feelings About Own Driving	% Response with respect to Drivers' Education						
	No Schooling	Primary School	High School	College	Graduation	Post graduation	Trade Course
a) I enjoy the feelings of speed	1.1	11.4	7.4	1.1	0.4	0	0
b) The faster I drive, the more alert I am	4.0	35.8	16.4	0.9	0	0.9	0
c) I often get impatient with slower driver	0.7	12.8	5.7	0	1.2	0	0
d) I try to get where I go as fast as I can	0	14.3	8.3	2.4	0	0	0
e) I worry a lot about having a crash	9.8	18.6	8.3	0.5	0	0	0
f) I always try to follow the traffic rules	9.4	42.5	32.3	3.5	0.7	0.8	0
g) I always keep in mind that other drivers may make mistakes and drive carefully	1.9	21.9	17.2	2.8	0	0	0
h) Others	0	2.5	2.5	0	0	0	0

Drivers' opinion about symptoms of aggressive driving behaviors

Drivers were asked about the symptoms of aggressive driving behavior. Summary of performing numerous potentially aggressive acts include race another driver (55%), weaving in and out (49%), failing to yield (44%), and driving inattentively (41%). Details of this can be seen in Table 10.

Table 10. Drivers' opinion about symptoms of aggressive driving behaviors

Symptoms of Aggressive Driving Behavior	% Response
a) Speeding	22.6

b) Driving too closely	30.8
c) Race another driver	55.2
d) Failing to yield	43.8
e) Weaving in and out	48.6
f) Honked the horn repeatedly	8.6
g) Failing to use turn signal	22.6
h) Running in red light	19.8
i) Ignoring stop signals	9.8
j) Driving inattentively	41.2
k) Others	0.2

(Multiple Response Question: Total may exceed 100%)

Symptoms of aggressive driving with respect to drivers age and experience

Drivers were asked about the symptoms of aggressive driving. Summary of the results with respect to age groups shows that 29% among all drivers who are 20-30 years old driver stated that race another driver as the symptom of aggressive driving and 21% of the same age limit drivers stated that weaving in and out as the symptom of aggressive driving. Details of this can be seen in table 11.

Drivers were asked about the symptoms of aggressive driving behaviors. Summary of the results with respect to drivers experience depicts that a significant number 6-10 years experienced driver (17%) stated race to another driver as the symptom of aggressive driving while 15% of the same age group drivers stated failing to yield as the symptom of aggressive driving. 14% among all drivers who have 1-5 years' and 11-15 years experienced stated that race another driver and weaving in and out as the symptom of aggressive driving respectively.

Table 11. Symptoms of aggressive driving with respect to age groups

Symptoms of Aggressive Driving Behavior	% Response with respect to Age Groups					
	20-30 years	31-40 years	41-50 years	51-60 years	61-70 years	>70 years
a) Speeding	11.5	6.8	4.3	0	0	0
b) Driving too closely	12.2	9.8	7.5	0.9	0.4	0
c) Race another driver	28.6	19.8	4.9	1.9	0	0
d) Failing to yield	20.4	11.0	9.5	2.9	0	0
e) Weaving in and out	20.9	16.5	8.3	2.5	0.4	0
f) Honked the horn repeatedly	5.5	3.1	0	0	0	0
g) Failing to use turn signal	11.8	9.8	0	1.0	0	0
h) Running in red light	16.8	1.5	0	1.5	0	0
i) Ignoring stop signals	5.9	2.0	1.3	0.6	0	0
j) Driving inattentively	18.8	18.3	4.1	0	0	0
k) Others	0.1	0.1	0	0	0	0

Symptoms of aggressive driving with respect to drivers' family monthly income

Drivers were asked about the symptoms of aggressive driving behaviors with respect to drivers' family monthly income. It indicates that 10-15 thousand taka per month income group driver (31% among all drivers) stated race another driver as the symptom of aggressive driving while 29% among all drivers stated driving inattentively as the symptom of aggressive driving. Details of this can be seen in Table 12.

Table 12. Aggressive driving with respect to drivers' family monthly income

Symptoms of aggressive driving behavior	% Response w. r. t. Drivers' Family Income (Tk)					
	5-10 thousand	10-15 thousand	15-20 thousand	20-25 thousand	25-30 thousand	>30 thousand

a) Speeding	2.6	11.9	6.0	1.3	0.4	0.4
b) Driving too closely	0	14.0	5.6	7.5	0.9	2.8
c) Race another driver	4.9	30.5	9.5	6.1	1.1	3.0
d) Failing to yield	0	16.6	8.8	12.4	2.4	3.6
e) Weaving in and out	3.7	20.9	9.8	10.5	2.2	1.5
f) Honked the horn repeatedly	1.9	4.9	1.2	0.6	0	0
g) Failing to use turn signal	3.9	10.8	3.9	2.0	0	2.0
h) Running in red light	1.5	18.3	0	0	0	0
i) Ignoring stop signals	0	3.3	1.2	3.3	0	2.0
j) Driving inattentively	3.7	28.7	6.2	2.1	0	0.5
k) Others	0	0.1	0.1	0	0	0

Symptoms of aggressive driving with respect to drivers' education

Drivers were asked about the symptoms of aggressive driving behaviors. Summary of the results with respect to drivers education demonstrates that 29% among all drivers who has primary education stated weaving in and out and race another driver as the symptoms of aggressive driving while 26% of them who has primary education stated failing to yield as the symptom of aggressive driving. 22% among all drivers who has high school education stated driving inattentively as the symptom of aggressive driving.

Symptoms of aggressive driving with respect to vehicle types

Drivers were asked about the symptoms of aggressive driving behaviors. Summary of the results show that race another driver and failing to yield (25%), weaving in and out (24%), driving inattentively (22%) and failing to use turn signal (18%) are the symptoms of aggressive driving. Details of this can be seen in Table 13.

Table 13. Symptoms of aggressive driving with respect to types of vehicle

Symptoms of aggressive driving behavior	% Response with respect to types of vehicle					
	Micro bus	Jeep	Pick up	Car	Leguna	CNG auto
a) Speeding	3.0	2.6	0	14.0	1.3	1.7
b) Driving too closely	5.6	6.5	0	14.9	2.8	0.9
c) Race another driver	11.4	6.9	0.8	24.7	7.6	3.8
d) Failing to yield	9.0	3.7	1.2	24.8	3.6	1.5
e) Weaving in and out	11.0	7.5	1.0	23.9	3.7	1.5
f) Honked the horn repeatedly	0.6	0.6	0	3.7	2.5	1.2
g) Failing to use turn signal	2.9	1.0	0	17.7	1.0	0
h) Running in red light	0	0	0	10.7	0	9.1
i) Ignoring stop signals	0	0.7	0	7.2	0	1.9
j) Driving inattentively	9.4	5.2	0	21.9	0	4.7
k) Others	0.1	0	0	0.1	0	0

(Multiple Response Question: Total may exceed 100%)

Drivers' opinion about usual driving behaviors of others

Drivers were asked about their usual driving behaviors while driving. Summary of the results shows that a significant number of drivers (45%) stated weaving in and out as usual driving behavior while driving. 45%, 39% and 36% of the drivers stated failing to yield, race another driver and driving inattentively as usual driving behavior while driving respectively. Details of this can be seen in Table 14.

Table 14. Drivers' opinion about usual driving behaviors of others

Normal driving behaviors of others	% Response
a) Speeding	19.6
b) Driving too closely	26.4
c) Race another driver	38.8
d) Failing to yield	44.6
e) Weaving in and out	45.0
f) Honked the horn repeatedly	15.8
g) Failing to use turn signal	28.8
h) Running in red light	27.8
i) Ignoring stop signals	14.4
j) Driving inattentively	36.4
k) Others	2.4

Drivers' opinion about usual driving behaviors of others with respect to age groups and education

Drivers were investigated about usual driving behaviors of others while driving. Summary of the results with respect to age groups shows that 29% of the drivers of 20-30 years age stated failing to yield as the usual driving behavior. 19% and 18% of the drivers of same age group (20-30 years) stated running in red light and weaving in and out (respectively) as the usual driving behavior while 17% of them said race another driver and driving inattentively as the usual driving behavior.

Drivers were asked about usual driving behaviors while driving. Results with respect to drivers education shows that a significant number of drivers (27% among all drivers) who has primary education stated failing to yield as the usual driving behavior. Another significant numbers of driver (23% and 20%) who has primary education stated weaving in and out and running in red light respectively as the usual driving behavior of others.

Comparison between drivers' symptoms of aggressive driving behaviors and usual driving behaviors

Drivers were asked about symptoms of aggressive driving behaviors and usual driving behaviors while driving. Summary depicts that 45% of the drivers stated weaving in and out as normal driving behavior whereas 49% drivers recognized this as aggressive driving behavior. 45% stated failing to yield as normal driving behavior while 44% drivers recognized this as aggressive driving behavior. A considerable number of drivers (39%) stated race another driver as normal driving behavior and 55% drivers recognized this as aggressive driving behavior. Details of this can be seen in Table 15.

Table 15. Comparison between symptoms of aggressive and normal driving behaviors

Symptoms of aggressive driving behaviors/ normal driving behaviors of others	Aggressive driving behaviors (% response)	Normal driving behaviors of others (% response)
a) Speeding	22.6	19.6
b) Driving too closely	30.8	26.4
c) Race another driver	55.2	38.8
d) Failing to yield	43.8	44.6
e) Weaving in and out	48.6	45.0
f) Honked the horn repeatedly	8.6	15.8
g) Failing to use turn signal	22.6	28.8
h) Running in red light	19.8	27.8
i) Ignoring stop signals	9.8	14.4
j) Driving inattentively	41.2	36.4
k) Others	0.2	2.4

Drivers' opinion about the causes of aggressive driving behaviors

Drivers were asked about the causes of aggressive driving behaviors. Summary of the results shows that habitual driving (68%), irregular driving (50%), competition on the road (46%), and pressure of passengers (35%) are the major causes of aggressive driving behavior. Details of this can be seen in Table 16.

Table 16. Drivers' opinion about the causes of aggressive driving behaviors

Causes of Aggressive Driving Behaviors	% Response
a) Habitual driving	67.6
b) Irregular driving	49.8
c) Less fuel consumption	9.0
d) Good condition of vehicle and road	15.4
e) Trying to avoid police	18.0
f) Traffic jam and loss of fuel and time	23.0
g) Pressure of passengers	35.2
h) Competition on the road	46.2
i) Being in hurry/time strain	33.0
j) Others	2.8

Causes of aggressive driving behaviors with respect to age and experience

Drivers were asked about the causes of aggressive driving behavior. Results with respect to age groups illustrates that 28% and 22% of the 20-30 years old driver stated habitual driving and competition on the road as the major cause of aggressive driving behaviors. 31-40 years old driver (26% among all drivers) also stated habitual driving as the cause of aggressive driving behaviors. Details of this can be seen in Table 17.

Table 17. Drivers' opinion about the causes of aggressive driving behaviors with respect to age

Causes of Aggressive Driving Behaviors	% Response with respect to Age Groups					
	20-30 years	31-40 years	41-50 years	51-60 years	61-70 years	> 70 years
a) Habitual driving	28.4	25.7	10.6	2.6	0.3	0
b) Irregular driving	16.1	20.9	11.2	1.6	0	0
c) Less fuel consumption	9.1	0.9	0	0	0	0
d) Good condition of vehicle and road	7.7	5.5	2.2	0	0	0
e) Trying to avoid police	11.8	4.2	2.0	0	0	0
f) Traffic jam and loss of fuel and time	16.3	5.0	0.6	1.1	0	0
g) Pressure of passengers	18.4	8.9	5.8	1.7	0.4	0
h) Competition on the road	22.2	22.2	0.9	0.9	0	0
i) Being in hurry/time strain	15.8	9.8	6.7	0.7	0	0
j) Others	1.4	1.4	0	0	0	0

(Multiple Response Question: Total may exceed 100%)

Causes of aggressive driving behaviors with respect to types of vehicle

Drivers were asked about the causes of aggressive driving behavior. Summary of the results with respect to types of vehicle demonstrates that a significant number car driver stated that habitual driving (40%), irregular driving (31%) and competition on the road (27%) as the major causes of aggressive driving behaviors. Details of this can be seen in Table 18.

Table 18. Causes of aggressive driving behaviors with respect to types of vehicle

Causes of Aggressive Driving Behaviors	% Response with respect to Types of Vehicle					
	Micro bus	Jeep	Pick Up	Car	Leguna	CNG auto
a) Habitual driving	13.5	9.2	1.3	40.3	2.0	1.3
b) Irregular driving	8.0	8.0	0	30.6	1.6	1.6
c) Less fuel consumption	0.9	0	0	3.2	3.6	1.3
d) Good condition of vehicle and road	2.2	2.2	0	11.0	0	0
e) Trying to avoid police	1.4	2.1	0.7	4.8	7.6	1.4
f) Traffic jam and loss of fuel and time	2.2	2.2	0	12.4	3.4	2.8
g) Pressure of passengers	7.9	2.8	1.7	15.6	5.0	2.2
h) Competition on the road	8.1	3.7	0.9	27.2	0	6.3
i) Being in hurry/time strain	8.3	7.5	0	16.5	0	0.7
j) Others	1.4	0	0	1.4	0	0

(Multiple Response Question: Total may exceed 100%)

Causes of aggressive driving behaviors with respect to drivers' experience, family monthly income and education

Drivers were asked about the causes of aggressive driving behavior with respect to drivers' experience. Result shows that 18% of the drivers who has 11-15 years' experience stated habitual driving as the cause of aggressive driving behaviors. 17% of the drivers who has 6-10 years' experience also stated habitual driving as the cause of aggressive driving behaviors. 16% among all drivers who has 6-10 years' experience stated competition on the road and 13% of them stated irregular driving as the cause of aggressive driving behaviors.

Drivers were asked about the causes of aggressive driving behavior with respect to driver's family monthly income. 39% of the drivers whose family income is 10-15 thousand taka per month stated habitual driving as the cause of aggressive driving behaviors while 35% of them stated competition on the road as the cause.

Drivers were asked about the causes of aggressive driving behavior with respect to driver's education. 30% among all drivers who has primary education stated habitual driving as the cause. 23% among all drivers who has high school education stated irregular driving as the cause of aggressive driving behaviors.

CONCLUSIONS

The questionnaire survey on light passenger-vehicle (microbus, jeep, pick-up, car, leguna and CNG auto-rickshaw) drivers was a realistic step to assess the levels of their awareness relative to road safety which necessitate further training and education to improve their performances in safe driving. Despite some limitations, the questionnaire survey provided some valuable findings about the present status of knowledge of light passenger-vehicle drivers regarding to road safety.

Approximately half of the drivers belong to 20-30 years age group and their average age was 32 years. 11% of the drivers do not have any formal education at all and about 50% of them received education up to primary school level. Nearly half of the drivers' family monthly income belongs in the range of taka 10,000 to 15,000. 78% of the drivers get their payment on monthly basis whereas 73% of them are employed on the basis of verbal agreements. As a result majority of the drivers usually suffer from a sense of insecurity and feelings of losing their jobs any time without any prior notice from their employer. The lack of security and self-content affect them unconsciously and often seriously while driving.

Nearly 26% of the drivers responded that they have to drive in fatigue or illness under pressure of employer beyond normal driving hours. Nearly 29% of the drivers responded that they never follow speed meter. CNG Auto Rickshaw and Leguna drivers have no scope of

following speed meter because these always remain out of order. Nearly 21% of the drivers responded that they sometimes or never follow traffic signs/signals and 17% of them sometimes use mobile phone. About 20% of the drivers responded that they sometimes use seat belt.

Result demonstrated that around 21% of the drivers' driving is considerably unsafe out of which 9% is 31-40 years age group. 5% have either 1-5 years or 6-10 years of driving experience. 11% of the respondent drivers have only primary education, 7% is 10-15 thousand taka family income group and 11% are car drivers. On the other hand nearly 67% drivers' driving is considerably aggressive out of which 34% is 20-30 years age group. 24% of the aggressive drivers have 1-5 years driving experience, 39% have only primary education, and 32% are car drivers.

Nearly half of the drivers stated weaving in and out and failing to yield as usual driving behavior on the other hand half of them recognized these as aggressive driving behavior. The other reasons which the drivers recognized as aggressive driving behavior are race another driver and driving inattentively which in turn their usual driving behavior.

The drivers themselves felt that "unsafe and aggressive driving" is the most notable reason for road traffic accidents which generally results from habitual driving (68%), irregular driving (50%) and competition on the road (46%). Other reasons which were identified by the interviewed drivers as causes of unsafe and aggressive driving, in the order of their importance are, pressure of passengers (35%), being in hurry/time strain (33%), traffic jam and loss of fuel and time (23%), trying to avoid police (18%) and good condition of vehicle and road (15%). The aggressive driving generally results from over speeding and overtaking tendencies due to tight time strain and sometimes pressure from the passengers.

DISCUSSIONS

This research is the first attempt of a scientific approach for identifying different aspects of light passenger vehicle drivers' habits towards aggressive driving. It should be noted here that the results obtained in this research are based on drivers' responses and self-reports. Further research to explore the reasons for aggressive driving behavior, well-designed and comprehensive statistical experiments is to turn out to be inspiring and beneficial. The use of multiple choice format of question also places some restrictions on the survey results as it eliminates respondent's freedom to express their own opinions and explanations. Therefore, the responses are influenced by possible choices. On the other hand, the use of self-administered surveys also assumes that the respondents are sufficiently literate to read, interpret and respond independently. Actually most of the drivers in Dhaka City are less educated or illiterate. As a result while survey was going on some of the drivers needed others assistance to read the survey form and let them understood. A majority of leguna and CNG auto rickshaw drivers in Dhaka City possess fake driving licenses or no driving license at all though all the drivers responded that they possess valid licenses. They did not cooperate with the survey team to take their interview because of their fear of police action. So this fact needs to be verified properly and independently as the result is based upon a self-reported study among drivers.

Despite some inherent limitations of the drivers' questionnaire survey, some specific recommendations for the development of effective measures for improving safe driving as well as for minimizing aggressive driving related accident can be suggested.

As an alternative approach for reducing aggressive driving as well as for minimizing aggressive driving related accident double or triple fine for violation of traffic rules could serves as an immediate preventive measure, with the potential to eliminate or at least

minimize road accidents significantly. Another alternative approach for reducing speeds as installation of traffic calming devices like rumble strip, jiggle bars, bar markings etc. could serve as a preventive measures, with the potential to eliminate or at least minimize road accidents significantly.

In the absence of any formal documents specifying drivers' job contracts, the basic salary structure and other fringe benefits, the overall connection between drivers and the vehicle owners need to be formulated and improved in terms of jobs certainty, decent treatment, decent payment, social acceptability, entitlement etc. The Government of Bangladesh should immediately initiate a method for development of a uniform salary-fringe benefit package of drivers and their job structure, payment structure, working time/schedule, social standing etc.

Drivers working periods and driving schedules must be kept within reasonable limits so that they could have adequate relaxation, sleep and rest with due facilities for parking of their vehicles, rest places and refreshments etc.

The theme of any driver-training program should focus on the development of such skills and knowledge which are known to be important for safe driving and the targeted groups should be drivers of young to mid age group. The training process should be a continual process and most importantly they must include safety oriented practical training.

The results of this study have shown that drivers are not the only group involved in unsafe and aggressive driving as well as aggressive driving related road traffic accidents. Other groups including the owners of the vehicles, passengers and pedestrians are also playing significant role in unsafe and aggressive driving as well as aggressive driving related road traffic accidents. Due to the involvement of other groups besides vehicle drivers, another comprehensive survey shall also be conducted on owners, passengers and pedestrians independently.

REFERENCES

- Government of the People's Republic of Bangladesh (2011–2013) Ministry of Communications Bangladesh Road Transport Authority, National Road Safety Strategic Action Plan, National Road Safety Council.
- Dula, C. S., and Geller, E. S. (2003) Risky, aggressive, or emotional driving: Addressing the need for consistent communication in research, *Journal of Safety Research*.
- Smart, R. G., & Mann, R. E. (2002), *Is Road Rage a Serious Traffic Problem?* *Journal of Traffic Medicine*. James L., and Nahl, H. (2002) *Road rage and aggressive driving*, Amherst, NY: Prometheus.
- AAA Foundation for Traffic Safety (2009) *Aggressive Driving: Research Update*, Washington DC (February 2011).
- Understanding Road Safety, (2004), *A Booklet for Heavy Vehicle Drivers*, Accident Research Centre, Bangladesh University of Engineering and Technology (BUET), Dhaka -1000, Bangladesh.
- National Highway Traffic Safety Administration, (2011) *Aggressive driving enforcement: Strategies for implementing best practices*.
- Neuman, T. R., Pfefer, R., Slack, K. L., Hardy, K. K., Raub, R., Lucke, R., and Wark, R. (2003). *Guidance for Implementation of the AASHTO Strategic Highway Safety Plan. Volume 1: A guide for Addressing Aggressive-Driving Collisions*. NCHRP Report 500. Washington, DC: Transportation Research Board.
- Leo, Tasca. (2000) *A Review on the Literature on Aggressive Driving Research*, Ontario Ministry of Transportation, Canada.

- Goehring, J. B., (2000) Aggressive Driving: Background and Overview Report, National Conference of State Legislatures, <http://www.ncsl.org/programs/esnr/aggrdriv.htm>, 17 pp.
- National Highway Traffic Safety Administration, NHTSA (1998a) Capital Beltway Update: Beltway User Focus Groups.
- National Highway Traffic Safety Administration, (1998b) National Survey of Speeding and Other Unsafe Driver Actions, Volume II: Driver Attitudes and Behavior.
- Kaysi, I. A. and Abbany, A. S. (2007) Modeling Aggressive Driver Behavior at Un-Signalized Intersections, Accident Analysis and Prevention.
- Choudhury, C. (2007) Modeling Driving Decisions with Latent Plans”, Ph.D. Dissertation, Massachusetts Institute of Technology, Cambridge, Massachusetts.
- Paleti, R., Eluru, N., and Bhat, C. R. (2010) Examining the Influence of Aggressive Driving Behavior on Driver Injury Severity in Traffic Crashes, Accident Analysis and Prevention.
- Deffenbacher, J. L., Lynch, R. S., and Oetting, E. R. (1994) Development of a driving anger scale, Psychological Reports.
- Buss, A. H. and Perry, M. P. (1992) The aggression questionnaire, Journal of Personality and Social Psychology.
- Miles, D. E. and Johnson, G. L. (2003) Aggressive driving behaviors: Are there psychological and attitudinal predictors, Transportation Research Part F.
- Al-Shihabi, T. and Mourant, R. R. (2003) Toward more realistic driving behavior models for autonomous vehicles in driving simulators, Presented at the 82nd annual meeting of the Transportation Research Board, Washington, DC.
- Cai, H., Lin, Y., and Mourant, R. R. (2007) Study on driver emotion in driver-vehicle-environment systems using multiple networked driving simulators, Presented at the Driving Simulation Conference, North America.
- Philippe, F. L., Vallerand, R. J., Richer, I., Vallières, E., and Bergeron, J. (2009) Passion for driving and aggressive driving behavior: A look at their relationship, Journal of Applied Social Psychology.
- Lajunen, T. and Parker, D. (2001) Are aggressive people aggressive drivers? A Study of the Relationship between Self-Reported General Aggressiveness, Driver Anger and Aggressive Driving.
- Chliaoutakis, J. E., Demakakos, P., Tzamalouka, G., Bakou, V., Koumaki, M., and Darviri, C. (2002). Aggressive Behavior While Driving as a Predictor of Self-Reported Car Crashes, Journal of Safety Research, 33, 431-443.
- Galovski, T. E., & Blanchard, E. B. (2002) The Effectiveness of a Brief, Psychological Intervention on Court-Referred and Self-Referred Aggressive Drivers”, Behaviour Research and Therapy.
- Naatanen, R., & Summala, H. (1976) Road user behavior and traffic accidents, New York: American Elsevier.
- Shinar, D. (1998) Aggressive Driving: the Contribution of the Drivers and the Situation, Transportation Research Part F.
- Mizell, L. (1997) Aggressive Driving in Aggressive Driving, AAA Foundation for Traffic Safety, Washington D. C.