INFLUENCE OF PERSONAL FACTORS ON RISKY DRIVING BEHAVIOUR OF POWERED TWO WHEELER DRIVERS IN KERALA

A THESIS

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"ALL ACTIONS ARE JUDGED BY INTENTIONS"

Dedicated to

My Parents………

Late Saboora Beevi Jalaludeen Labba
and
Late Haji Hassan Mohammad Abdurazack Rawther

THESIS CERTIFCATE

This is to certify that the thesis entitled **INFLUENCE OF PERSONAL FACTORS ON RISKY DRIVING BEHAVIOUR OF POWERED TWO WHEELER DRIVERS IN KERALA** submitted by **Thajudeen H** to the Cochin University ofScience and Technology, Kochi for the award of the degree of Doctor of Philosophy is a bonafide record of research work carried out by him under my supervision and guidance at the Division of Safety and Fire Engineering, School of Engineering, Cochin University of Science and Technology. The contents of this thesis, in full or in parts, have not been submitted to any other University or Institute for the award of any degree or diploma. All the relevant corrections and modifications suggested by the audience during the pre-synopsis seminar and recommended by the Doctoral Committee had been incorporated in this thesis.

Kochi-682022   Prof. (Dr.) M.N.Vinodkumar
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DECLARATION

I hereby declare that the work presented in the thesis entitled **INFLUENCE OF PERSONAL FACTORS ON RISKY DRIVING BEHAVIOUR OF POWERED TWO WHEELER DRIVERS IN KERALA** is based on the original research workcarried out by me under the supervision and guidance of Prof. (Dr.) M.N. Vinodkumar, Division of Safety and Fire Engineering, School of Engineering, Cochin University of Science and Technology for the award of degree of Doctor of Philosophy with Cochin University of Science and Technology. I further declare that the contents of this thesis in full or in parts have not been submitted to any other University or Institute for the award any degree or diploma.

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ABSTRACT

Keywords: Powered Two Wheeler drivers, risky driving, drunken driving, cell phone usage, personality traits, safety attitudes.

Powered Two Wheeler accidents are of great concern in all parts of the world, as they are potentially higher in number of cases and more serious when compared to accidents of all other vehicles. It is evident from the records of Kerala Police that Powered Two Wheeler related crashes and fatality have increased by 35.42% and 40.60% during the period from 2010 to 2017, whereas a decrease of 2.20% and 7.22% in crashes and fatality respectively are recorded in the case of all other vehicles put together during the same period. Risky driving has been identified as an important contributor to road crashes. Reports from various parts of the world have identified few personal factors as predictors of risky driving of the Powered Two Wheeler riders.

From literature review, this study selected six types of risky driving behaviour and eight types of influencing variables, in addition to demography (age, gender and education) of the driver. A questionnaire was designed to measure these variables. The data was collected by a questionnaire survey in all districts of Kerala State, among the Powered Two Wheeler drivers (Sample size - N = 1299; 1089 males and 210 females) age between 18 and 63 who possess a driver's licence.

The analyses of the data was carried out in three stages: (1) Statistical significance of demography (age, gender and education) with respect to (i) six risky driving variables, i.e., risky driving due to (self assertiveness, speeding, and rule violation), drunken driving, cell phone use, and negligence of bike examination (ii) three safety attitudes, i.e., attitude to rule obedience, attitude to speeding and attitude to use helmet and (iii) two family climate for road safety (family involvement and commitment to safety) were examined. (2) Hierarchical regression analyses in the whole sample and sub samples were conducted to determine the

prominent predictors of the six risky driving variables and (3) Mediation analysis was conducted to investigate the role of safety attitudes and personality traits as mediators in the link between age and risky driving, and gender and risky driving as well.

The results showed that, young, male and less educated drivers who score high in all risky driving behavior, expose themselves to higher risky driving. Female and old drivers were found to possess higher levels in most of the attitudinal scales. Also scores of risky driving of less educated drivers (below degree) were found higher than that of the drivers with degree and above degree education levels. Hierarchical regression analysis revealed that young, male and educated (above degree) drivers who use sensation seeking and normlessness might engage in the most high-risk driving behaviour and prominent predictors of risky driving are sensation seeking, normlessness, safety attitudes, and family involvement. Mediation analyses revealed that safety attitudes and personality traits mediate the link between age and risky driving, as well as gender and risky driving. This indicates that risky driving can be reduced by enhancing safety attitudes and altruism, and decreasing sensation seeking and normlessness. From results it was inferred that the most vulnerable group of drivers are young, males with high scores of sensation seeking and normlessness and low scores of safety attitudes. However, the mediation analysis indicated that by shaping safety attitudes and altruism (enhancing) and sensation seeking and normlessness (decreasing), the risky driving among this population can be controlled. This goal could be reached by starting to educate children about this at an early stage when they are at school as well as by social learning and safety awareness campaigns. The strength and limitations and scope for further work are also discussed.

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GLOSSARY

Altruism	Active concern for others
Cell phone usage	Use cell phone while driving
Drunken driving	Driving after consuming alcohol
Family climate for road safety	Assessing the family climate by means of two aspects of the parent–child relationship: Family involvement and commitment to safety
Helmet usage	Use helmet while driving
Normlessness	Belief that socially unapproved behaviours are required to achieve certain goals
Personality traits	Dimension of individual difference, the tendency to show consistent patterns of thoughts, feelings and actions
Powered two-wheeler	Two wheeler with engine capacity above 50 cubic centimetres
Risky Driving Behaviour	Referred as an activity that may place the driver to meet a crash with injuries/fatality and/or property damage
Sensation seeking	Seeking of varied, novel, complex and intense sensations and experiences, and the willingness to take physical, social, legal and financial risks for the sake of such experience

ABBREVIATIONS

AH	Attitude to use helmet
AL	Altruism
AR	Attitude to rule obedience
AS	Attitude to speeding
CS	Commitment to safety
CU	Cell phone usage
DD	Drunken driving
DUI	Driving under the influence of alcohol
FCRS	Family climate for road safety
FI	Family Involvement
GDL	Graduated driver licensing
MVD	Motor Vehicle Department
NCRB	National Crimes Records Bureau
NE	Negligence of bike examination
NIMHANS	National Institute of Mental Health and Neurosurgery
NM	Normlessness
PPE	Personal Protective Equipment
PTW	Powered Two Wheeler
RA	Risk driving (self assertiveness)
ROW	Right of Way
RS	Risky driving (speeding)
RTC	Road Traffic Crash
RTI	Road Traffic Injury
RV	Risky driving (rule violation)
SD	Standard Deviation

SES	Socio-economic status
SS	Sensation Seeking
U.K	United Kingdom
USA	United States of America
WHO	World Health Organization

NOTATION

α   -   Cronbach's Alpha

β   -   Beta (Standardized coefficient of regression

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This research comes under the broad category of road safety, specifically the risky driving behaviour of two wheeler riders. Traffic safety related to motorcycling and more generally to Powered Two Wheeler (PTW) driving constitutes a growing issue all over the world, in relation with both the increasing use of this means of transport and its intrinsic vulnerability (WHO, Global status report on road safety: Time for action, Geneva, 2009; WHO, 2004) as compared with other types of vehicles. The attempt to reduce the number and severity of road crashes necessitated the formulation of road traffic regulations to guide operation, conduct and other issues relating to the road and road users. The present research work considers the risky driving behaviour of powered two wheeler riders of Kerala, India. This chapter provides an overview of the thesis and states the research framework along with specific research aims.

1.2 THE THEME

Road traffic crash is a leading cause of premature death globally and it is the main cause of the causality among those aged between 15 and 29 years (Global Status Report on Road Safety, 2014). Moreover, low-income countries have twice higher fatality rates than in high-income countries. Ninety percentage of road traffic deaths occur in low and middle-income countries, in spite of the fact that these countries have just 54% of the world's vehicles (Global Status Report on Road Safety, 2015).

There has been an alarming increase in death rate due to accidents on Indian roads over the years. According to official statistics 141,526 persons were killed and 477,731 injured in road traffic crashes in India in 2014 (NCRB, 2015; Road Accidents in India, 2015). However, this is probably an underestimate, as not all injuries are reported to the police and the actual numbers of injuries requiring hospital visits may be 2,000,000-3,000,000 persons (Mohan, Tiwari and Bhalla, 2015). Table 1.1 shows the personal vehicle ownership and official road traffic fatality rates per 100 populations in ten countries including India (W.H.O., 2015 – cited in Mohan, Tiwari and Bhalla, 2015).

Table 1.1* Personal vehicle ownership and official road traffic fatality rates per 100 populations (Source: W.H.O., 2015)

Country	PTW +Light 4 wheeler per 100 population	Official fatality rate per 100 population (Source W.H.O., 2015)
India	**6**	**11**
Australia	71	5.1
Canada	61	6
Chile	45	12
Greece	60	7.8
Hungary	32	6
Japan	69	4.5
Portugal	56	6
Swedan	56	2.7
United Kingdom	54	2.8

* Source: Mohan, Tiwari and Bhalla (2015).

The Table 1.1 also shows eight countries with much higher vehicle ownership rates than India, but lower Road Traffic Injuries (RTI) and fatality rates. This indicates that increase in vehicle ownership need not be a reason for increase in fatality rates (Mohan, Tiwari and Bhalla, 2015).National Crimes Records Bureau (NCRB), Government of India, reports that Kerala ranks fifth among the states of India, in

sharing 8.0% of total road accidents in India (NCRB, 2014). The global rate of powered two wheeler (PTW) accidents is found to be 23% of the total road accidents (Global Status Report on Road Safety, 2013; 2015), while in India, National Crimes Records Bureau (NCRB), reports that PTW accident as 26.4% of the total road accidents during the same period (Accidental Deaths, 2014).

Traffic police records of Kerala State, during the past eight years (2010-2017), reveal that 31-39% of the total road accidents and 25-34% of fatality due to road accidents has the involvement of PTW riders (Kerala Police, 2018). It is evident from the records that PTW related crashes and fatality have increased by 35.42% and 40.60% during this period, whereas a decrease of 2.20% in crashes and decrease of 7.22% in fatality are recorded in the case of all other vehicles put together during the same period (Kerala Police, 2018). Table 1.2 displays comparison of road traffic crash (RTC) statistics of PTW and other vehicles for the period 2010-2017 (Kerala Police, 2018).

Table 1.2 Road Traffic Crash (RTC) statistics for the period 2010-2017 in Kerala
(Source: Kerala Police, 2014-2018)

Year	Total RTC involved by			Total fatalities involved by			% of total RTC/ fatality involved by PTW	% increase of RTC/fatality from year 2010 involved by	
	All vehicles	PTW	Non PTW	All vehicles	PTW	Non PTW		PTW	Non PTW
2010	35082	11052	24030	3950	975	2975	31.5/24.7		
2011	35216	11303	23913	4145	1097	3048	32.1/26.5	19.14/ 37.74	-3.8/ -9.0
2012	36174	12479	23695	4286	1668	2618	34.5/39.9		
2013	35215	12209	23006	4258	1289	2969	34.7/30.3		
2014	36282	13167	23115	4049	1343	2706	36.3/33.2		
2015	39014	14482	24532	4196	1330	2866	37.1/31.7	35.42/ 40.60	-2.2/ -7.2
2016	39420	14849	24571	4287	1474	2813	37.7/34.4		
2017	38470	14967	23503	4131	1371	2760	38.9/33.2		

Risky driving behaviour may be defined as an activity that may bring the driver to face a crash with injuries/fatality and/or property damage. In other words, this behaviour refers to the tendency to engage in activities that have the potential to be harmful or dangerous. Risk has been defined in many ways, for example: to put oneself "at risk" means to participate either voluntarily or involuntarily in an activity or activities that could lead to injury, damage, or loss.

With the road conditions remaining the same for all types of vehicles and inherent safety issues of powered two wheelers also remaining the same, the possible influencing factor for this higher percent increase in PTW involved crashes over other vehicle types may be related to the personal factors of the driver such as demographic variables, personality traits, social influences and safety attitudes. Therefore, it is important to study the mechanism with which the safety attitudes and characteristics of drivers work together contributing to PTW involved crashes.

1.3 MOTORCYCLING

As transportation and mobility become an essential component of our life, motor vehicles have become unavoidable in modern lifestyle. Since there has been no significant increase in mass public transportation systems, two-wheeled motorcycles have become the major choice of people. Even though motorcycles are economical for the individual, this motorization has raised considerable problems in the society. An accompanying feature of this change has been a consequent increase in Road traffic injuries (RTI) and deaths (Gururaj, 2005). Considering the constraints of time and need for travel, individual personal modes of transport are becoming the law of the land. Of late, a large number of poor and middle-income families have opted to

Use PTWs as they are not highly expensive and are within their reach. Although a motorcycle is ameans of transport and a source of pleasure, some drivers consider it as an instrumentof freedom and a means of thrill of speed to motivate them to take certain risks (Joshi et al., 2010). The legal definition of a motorcycle for the purposes of registration, taxation and rider licensing in most countries is "powered two-wheeler" with engine capacity above 50 cubic centimeters.

1.3.1 Motorcycle Licence

In India, two wheelers powered by engines with capacity of 50 cubic centimeters and above are to be registered with the government authorities and the drivers need driving licenses issued by the motor vehicles department of the State. Kerala Motor Vehicles act, 1988 reveals that aspirants of age 18 years or more can apply for a driving license to drive a PTW (Kerala MVD, 2015). Authorities will issue the driving licence in two stages: (1) Learners licence for a period of 6 months after qualifying a written test based on road safety during which the driver should operate the vehicle under the supervision of a licensed driver (2) Full license for a period of 20 years or up to the age of 50 (whichever is earlier) after qualifying a practical test on road and ground. Afterwards one can renew the license up to the age of 50 and for every 5 years thereafter. If the driver gets a ticket (for any driving offense such as speed exceeding the limit or drunken driving) then he/she will be disqualified to drivethe vehicle from six months to one year with a fine. After completion of this disqualifying period a new licence will be issued after endorsing this information.

1.4 RESEARCH ISSUES

This research is aimed at estimating the role of contributing factors of risky driving behaviours of PTW drivers of Kerala. Thus considering the effect of various personal factors such as demography (age, gender and education level, driving experience and so on), personality traits (altruism, sensation seeking, normlessness and so on), safety attitudes (attitude to rule obedience, speeding and so on) and family climate for road safety (e.g., family involvement) of PTW drivers, on various types of risky driving behaviour, this research venture identifies the following research issues.

1. Identification of various types of risky driving behaviour of PTW drivers.

2. Enunciating the role of the contributors in the development of risky driving behaviour of the PTW drivers of Kerala.

3. Bringing out the interventions which can be adopted to mitigate the risky driving behaviour of the PTW drivers of Kerala.

1.5 RESEARCH OBJECTIVES

Considering the research issues identified in the previous section, the following research objectives are formulated for the current study.

1. To identify the different types of risky driving behaviour and its influencing factors

2. To develop an instrument to measure the identified risky driving behaviour and its influencing factors.

3. To conduct an analysis to examine the influence of certain personal factors on various types of risky driving behaviour, which are identified.

4. To determine the predictors of each of the risky driving behaviour and their interactions.

5. To examine the mechanism with which the influencing variables interact producing impact on risky driving.

6. To identify the most risky group of drivers, on the basis of the result.

7. To recommend the intervention strategies to reduce the risky driving of the PTW drivers of Kerala.

1.6 SCOPE OF THE WORK

The scope of the present research is as follows:

1. The research was carried out in the state of Kerala, India.

2. This research was based on a questionnaire survey carried out among the PTW drivers from all the 14 districts of Kerala.

3. The sample consists of (i) faculty members, non-teaching staff and the students of selected colleges (ii) employees of public and private offices (iii) commuters of trains (iv) workers in various industries and work sites and (v) social gatherings.

4. The questionnaire survey was conducted for a period of 6 months in the year, 2014.

1.7 RESEARCH FRAMEWORK

The first part of the research work presented in this thesis deals with the development of an instrument for measuring different types of risky driving behaviour and their possible predictors. From a review of related literature, the influencing variables, predictors and types of risky driving behaviours were identified. Initially, a draft questionnaire containing seventy items, covering the dimensions of driver characteristics on road traffic, was prepared. This was subsequently fine-tuned to a fifty-six-item instrument after carrying out a preliminary survey, reliability analysis

and discussions with road safety professionals and management experts. Responses to these items were solicited on five point Likert scale from "Strongly disagree" to "Strongly agree". Three demographic (age, gender and education level of the PTW driver) variables were also included for use in various analyses.

1.8 ORGANIZATION OF THE THESIS

The thesis is presented in seven chapters. The contents of each chapter are presented in subsequent sections.

Chapter 1: Introduction

This chapter introduces the status of global road safety as well as road safety in India and Kerala. The need and motivation for the current research sprouted from this. It discusses the importance of motorcycling and procedural steps of licensing. Risky driving behaviour is defined and the research issues and objectives are discussed. It envisages the methodology and scope of the research to accomplish the objectives. This chapter ends with a brief chapter - wise summary of the research work in the thesis.

Chapter 2: Literature Review

In Chapter 2, a comprehensive review of literature on different types of risky driving and its relationship with (1) demographic variables (2) personality traits (3) safety attitudes and (4) family climate for road safety of PTW drivers is presented. In addition, intervention strategies on road safety are reviewed. Observations from the literature review and motivation for the present study are discussed at the end of this chapter.

Chapter 3: Research methodology

Research methodology is discussed in Chapter 3. Different types of risky driving behaviour and its influencing variables from literature revieware identified, and relevant study variables are selected from this list. This is followed by a discussion about developing an instrument for measuring the predictors and various types of risky driving behaviour. Self reported data and the reliability analysis of all study variables are presented. The correlation of all variables of this study is presented, with a brief discussion.

Chapter 4: Influence of Demography on Risky Driving and Attitude Variables

In Chapter 4, the statistical significance of the demography (age, gender and education) with respect to (1) different types of self reported risky driving variables (2) safety attitude variables and family climate for road safety (family involvement and commitment to safety) of powered two wheeler (PTW) drivers are examined. This is followed by a discussion on the findings. Practical implications are also discussed.

Chapter 5: Risky Driving Behaviour and their Predictors

Chapter 5 presents hierarchical regression models for each of the identified risky driving behaviours. Prominent predictors of each of the regression models and other significant findings are explained and results are discussed with practical implications.

Chapter 6: Influence of Personality and Attitudes on the relationship between Age/Gender and Risky Driving Behaviour

In Chapter 6, mediation role of safety attitudes and personality traits on age-risky driving relationships and gender-risky driving relationships are examined. This is followed by a discussion to pull down the risky driving behaviour of PTW drivers by shaping (changing) personality traits and safety attitudes. Practical implications are also discussed.

Chapter 7: Summary and Conclusions

A summary of the results and contributions of the research are presented in Chapter 7. The strength and limitations of this research work and scope for future research are also presented here along with the recommendations and conclusions of the researcher.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter provides a comprehensive review of literature related to the risky driving of powered two wheelers (PTW) and their relationship to the probable influencing factors. The intention of this literature review is three fold. Primary task is to identify various types of risky driving behaviour. Next is to identify the personal factors of drivers, which influence these risky driving variables and finally to review the safety interventions on risky driving behaviour of the PTW drivers. At the end of this chapter, observations from this chapter and research motivations are discussed.

2.1.1 Why Motorcycling

Motorcyclists are considered as vulnerable since they benefit from little or no external protective devices or are unprotected by an outside shield that would absorb energy in a collision. They constitute, with almost no exception, the weak party in a road traffic crash (Constant and Lagarde, 2010). Heterogeneity of the population of motorcyclists fetch the attention of researchers, both in their riding styles and their motorcycles, as this relates to their motivations to use it as a mode of transport. For many drivers, a motorcycle is a means of transport, whereas to some other riders, it is a source of thrill of speed and pleasure which motivate them to take certain risks (Joshi et al., 2010). The advantages of riding a motorcycle is they are a more economical means of transport, and more flexible in manoeuvring and parking due to reduced size.

2.2 RISKY DRIVING

Generally, PTWs are dynamically unstable vehicles; therefore, the possibility for a crash involving a PTW is higher than for other vehicles on the road. Elliott, Baughan, and Sexton (2007) revealed that PTW drivers specifically have a greater risk of being victims in a traffic crash compared to any other vehicle users. Risky driving and severity of accidents of powerful engine of PTW increases, due to greater instability at low speeds, difficulty in controlling, high acceleration capabilities and difficulty in braking (Joshi et al., 2010). Lin and Kraus (2009) reported that PTW drivers are over 34 times more likely to have a fatality in a traffic crash than other type of motor vehicle drivers. In another study, Horswill and Helman (2003) compared PTW drivers with a corresponding group of automobile drivers who are not PTW drivers, and discovered that PTW drivers preferred faster driving, and that they overtake other vehicles more often. Hobbs et al. (1986- cited in Jevtić et.al, 2012) reported that the majority of drivers in their sample stated that their main motivation for riding was the enjoyment they obtained from the activity.

Hurt et al. (1981), after conducting a post-crash interview among motorists involved in crashes with PTWs, stated that they did not see motorcycles while making manoeuvres until the last moment before collisions which has been termed as 'look but failed to see effect'. Motorcyclists, however, often indicated that they thought they had made eye contact with the driver of the car before the collision. They also reported that motorists involved in accidents with motorcycles tended to be alien to riding motorcycles.

Lardelli-Claret et al. (2005) showed that inappropriate speed for the road or traffic conditions was the best predictor of the risk of causing a collision for PTW drivers, consistent to Elliott, Armitage and Baughan (2004). Lardelli-Claret et al. (2005) also found that driving under the influence of alcohol (DUI), especially with a positive test

result, was the second factor most strongly related to the risk of causing a collision for PTW drivers. Non-helmeted drivers without a valid license were the third factor most strongly related with the risk of causing a collision. In another study Strayer, Drews and Crouch (2006) found that drivers using a cell phone exhibited a delay in their response to events in the driving scenario and were more likely to be involved in a traffic accident.

 Vlahogianni, Yannis and Golias (2012) reported that risky driving behaviour is usually reflected on activities such as speeding, disobeying traffic signals, give-way or stop sign, non-compliance to overtaking restrictions or pedestrian crossing, making illegal turns, maintaining short gaps with the precedent vehicles and so on. Mannering and Grodsky (1995) stated that, because motorcycle riding is well known to be a dangerous activity; it "may tend to attract risk-seeking individuals, of all age and socioeconomic categories", which may have a corresponding effect on the total motorcycle accident figures. In a study in US, Savolainen and Mannering (2007) found that drunken driving, unsafe speed, and not wearing a helmet increase the crash injury severity.

Risky driving has been identified as an important contributor to road crashes (Jonah, 1986; Gregersenlz and Berg, 1994; Gregersenlz and Bjurulf, 1996; Lin et al., 2003). In his review of the literature, Jonah (1986) illustrated a link between various risky driving behaviours and road trauma.

Many studies have shown that there are different types of risky driving (predicted by a range of predictors), practised by PTW drivers such as risk due to self assertiveness, speeding and rule violation (Ullberg and Rundmo, 2003; Chen, 2009) and drunken driving (Kasantikul et al., 2005), driving without helmet (Dandona et al., 2006; Jung, Xiao and Yoon, 2013), cell phone use while driving (Walsh, 2009), negligence of vehicle examination (Chang and Yeh, 2007), aggressive driving, not using indicators

and driving while fatigued (Fernandes, Job and Hatfield, 2007). Further, Fernandes, Job and Hatfield (2007) concluded that, motivation to engage in different risky behaviours may vary considerably (For example, the reasons for a driver engaging in speeding may not be the same factors that contribute to their decision to drink-drive).

2.2.1 Drunken driving

Driving after drinking alcohol leads to risky driving and results in road crash injuries and fatalities (Kasantikul et al., 2005; Chong, 2014; Horwood and Fergusson, 2000; Rakauskas et al., 2008; Kulick and Rosenberg, 2000). Horwood and Fergusson (2000) found that drunken driving was related to active traffic accidents, and those who engaged in frequent drunken driving had rates of active traffic accidents that were 2.5 times higher than those who did not drink and drive. Wilson, Stimpson and Tibbits (2013) found that alcohol-involved drivers who use electronic devices or engage in other forms of distracting activities are not only physically and cognitively impaired from the alcohol consumption but also visually-impaired from having to avert their eyes from the road while manipulating electronic devices or performing other non-driving related activities. In another study, Kasantikul et al. (2005) examined motorcycle crash data in Thailand to identify crash factors among 969 collisions involving 1082 motorcycle drivers, and found that 393 drivers were under the influence of alcohol (DUI). Results revealed that drunken driving were more likely to lose control of the PTW, usually by running off the road and violate traffic signals. In a Swedish study, Aberg (1993) found that social norms and attitudes predicted drunken driving. In a Canadian study by Leadbeater, Foran, and Grove-White (2008) found that young drivers' high-risk attitudes and experiences led them to be involved in drunken driving. In a similar study, Marcil, Bergeron and Audet (2001) found the relationships between motivational factors and the intention to drink and drive among young male drivers

aged 18–24, which indicated the driver's drunken driving was primarily predicted by attitudes, followed by the peer influence, confirming the findings of Parker et al. (1992).

Leadbeater, Foran, and Grove-White (2008) confirmed that males were more involved in impaired driving and alcohol-related crashes than females consistent to the findings of Kasantikul et al. (2005); Brookhuis et al. (2011); Font-Ribera et al. (2013) and Romano, Peck and Voas (2012). Moskal et al. (2012) found that male motorcyclists driving without helmets, exceeding the legal limit for alcohol and travelling for leisure purposes increased the risk of accident involvement. This finding is contradicted by Dobson et al. (1999) who found that young women drivers are more involved in drunken driving than male drivers, in an Australian context.

Romano, Peck and Voas (2012) investigated the role of age, female, married, and employment of the drivers on alcohol impaired driving in California, which confirmed some well- known relationships i.e., high socio-economic drivers were less likely to drink and drive than the low SES drivers. They also found that drivers aged 20 and below were much less likely to be involved in drunken driving, compared to drivers aged 25 to 54. However, when drivers younger than 21 drink and drive, they are more likely to have crashes than are older drivers who drink and drive. Jonah (1990) examined the influence of age differences in reported drink and drive and traffic violation and accident involvement among 10 000 drivers aged 16–69 and found that young drivers (16–24) were not only more likely to engage in risky driving but also have higher accident and violation rates. Jonah also found that, the 20–24 age groups was generally more likely to report drink driving than the 16–19 age groups. This result is contradicted by Papadimitriou et al. (2014) who found no significant effects of rider age on declared drinking and driving among motorcyclists in Europe. In another study, Fernandes, Job, and Hatfield (2007) investigated the role of demographic, personality and attitudinal factors in the prediction of a range of risky driving and found that drink

driving was significantly predicted by sensation seeking and specific attitude to drink-driving, similar to the findings of Lonczak, Neighbors and Donovan (2007).

2.2.2 Helmet Usage

Helmet is one of the most important items of personal protective equipment (PPE) used by motorcyclists for protection against the hazards connected with driving on roads. Helmets usually made of a rigid fibre glass or plastic shell, a foam liner, and a chinstrap, have been the principal countermeasure for preventing or reducing head injuries from motorcycle crashes (Lin and Kraus, 2009).National Institute of Mental Health and Neurosurgery (NIMHANS) studies from India, have reported that nearly one third of injured or killed two wheeler drivers sustain injury to the brain in a crash and also found that mortality among unhelmeted drivers and pillion riders was 2.2 times higher compared with helmeted drivers (Gururaj, 2005).

Dandona et al. (2006) reported that moped (less than 50 cubic centimeter) and scooter drivers in India, do not wear a helmet because they believe that moped and scooter are not "powerful vehicles" that could be driven at a high speed like motorcycles. This study also found that driving without helmet is an attitude to traffic violation and concluded the driver, who does not take care of his own safety, is not expected to take care of safety of other road users. Similar results were found in the study of Houston and Richardson (2007). In another study in Vietnam, Hung, Stevenson and Ivers (2008) identified factors associated with helmet use namely, (i) a positive attitude towards helmet use, (ii) age 25 years and above, (iii) riding on a compulsory road, (iv)

trips of more than 10 km, and (v) higher levels of education (university degree and higher), while negative attributes of helmet use are "inconvenience and discomfort in hot weather".

Donate-Lopez et al. (2010) analyzed data of 48 016 pairs of drivers and pillion riders aged 14 years or more in PTW involved crashes with victims in Spain from 1993 to 2007 and revealed that helmeted female drivers appeared to be markers of less severe crashes than male drivers for their involvement in greater severity of crashes. This study also found that increase in age, being a female and non-helmet use seemed to be associated with an increase in the risk of death and wearing a helmet decreases the risk of being involved in a motorcycle crash. Two Malaysian studies by Kulanthayan et al. (2001) and Md Nor and Abdullah (2014) reported similar results that the proper usage of helmet was higher for PTW drivers above 21 years of age, female drivers and pillion passengers.

2.2.3 Cell Phone Usage

Distraction and inattention have been a concern for road safety professionals for many years, but the controversy regarding cell phone usage while driving has prompted a surge of research in this area. Any activity that takes the attention of the driver, away from the task of driving, can be treated as distracted driving (Lee, Young and Regan, 2009; Lee, 2007).

Walsh et al. (2008) investigated the factors influencing the decision to use a mobile phone while driving in an Australian context. Attitude to use mobile phone was found to be the most consistent predictor to use it while driving, indicating that drivers with a positive attitude towards using a mobile phone while driving are most likely to use it. Walsh et al. (2009) also found that self and social gratifications for enjoyment or

pleasure are related to cell phone use. The authors further reported that the most common use of cell phone while driving is answering a call as opposed to an outgoing call that can be delayed, and used for security purposes, with an intention to contact peers and friends. Similar results were found in Li, Gkritza and Albrecht (2014) and Nemme and White (2010) who found that attitude is the main predictor of cell phone usage. Lesceh and Hancock (2004) observed that many drivers may not be aware of their decreased performance while using cell phones. In another study among the drivers of British Columbia, Canada, Wilson et al. (2003) reported that driving records of cell phone users had higher counts of violations, including speeding, alcohol, and failure to use PPE, non-moving offenses, and aggressive driving. Brusque and Alauzet (2008) found that men are overrepresented among drivers who phone while driving, and one quarter of those who phone while driving receive or give more than five calls a day.

Pöysti, Rajalin and Summala (2005) examined the factors that influence cell phone usage while riding in Finland. The results showed that young, male drivers more often used their phones while driving than the older drivers and females, possibly because they assume themselves more skilful than older and female drivers, while law-abiding and safety oriented drivers used their phones less frequently, consistent to the findings of Young and Lenné (2010). The researchers also found that almost half of the drivers who used a phone while driving reported that they had experienced dangerous situations while using the phone.

Tornros and Bolling (2006) found that, the combined effect of cell phone use and the demanding traffic environment might result in serious safety problems in the complex road environment, due to slow reaction times. Hassan and Abdel-Aty (2013) found among 680 young drivers in Central Florida drivers below the age of 24 years are more

involved in cell phone usage while driving. Tractinsky, Ram and Shinar (2013) found that regardless of road conditions, young drivers are more likely to initiate calls than older and more experienced drivers. In another study, Weller et al. (2012) observed that individuals who perceive a strong attachment to their phone would be more likely to use it, even while driving. In another study, Pileggi et al. (2006) found that motorcycling with cell phone usage and under the influence of alcohol was higher in males. They also found that 25.7% accident in the past one year involvement of those who used cell phone while driving wassignificantly higher than of those who didn't. This study also reported that adolescents who were always motorcycling over the speed limit were at a lower risk of using a cell phone while driving.

2.2.4 Negligence of Bike Examination

The driver is the first line of defence against unexpected breakdowns and repairs. It is important that the driver communicates vehicle problems immediately to service station or the owner. This helps the driver in reducing breakdowns. The following vehicle systems should be monitored by the PTW driver (1) Vehicle safety items (e.g., tyres, horn, brakes, etc.) (2) Vehicle drivability items (e.g., misfire, rough idle, etc.) and (3) Vehicle body (body damage, cleanliness, etc.). If the PTW driver fails to inspect the bike prior to and after a trip, a potential problem may go unnoticed, causing a breakdown or unsafe condition. Chang and Yeh (2007) examined „„negligence of vehicle examination", among the motorcyclists of Taiwan, and found that it was not significantly associated with increased accident risk.

2.3 INFLUENCING FACTORS OF RISKY DRIVING

Numerous studies were carried out in the past to explore the various influencing factors of risky driving behaviour. These influencing factors are found to be speed, engine size,

personal factors of drivers such as demography (age, gender, education level and driving experience), personality traits (altruism, sensation seeking and normlessness, aggressiveness, anxiety, locus of control and so on), safety attitudes (attitude to rule obedience and speeding, attitude to use helmets and cell phone while driving and specific attitudes to involve specific risky driving such as dangerous overtaking, drunken driving and so on) and family climate for road safety such as family involvement, self efficacy, peers norms and commitment to safety (Blackman and Haworth, 2013; Aarts and Van Shagen, 2006; Schneider IV et al., 2012; Rutter and Quine, 1996; Hassen et al., 2011; Bianchi and Summala, 2004; Dandona et al., 2006; Walsh et al., 2008; Claret et al., 2003; González-Iglesias, Gómez-Fraguela, and Luengo, 2014; Ulleberg and Rundmo, 2003; Falco et al., 2013).

2.3.1 Speed

Speed is an important factor in road safety. Speed not only affects the severity of a crash, but also is related to the risk of being involved in a crash. Once a crash occurs, the relationship between speed and the outcomes of a crash is directly related to the kinetic energy of an impact and is related to the mass of the object and square of velocity (e.g. Elvik et al., 2004 – cited in Aarts and Van Shagen, 2006). It is easy to understand that at high speeds the time to react to changes in the environment is shorter, the stopping distance is larger, and manoeuvrability is reduced (Aarts and Van Shagen, 2006).

2.3.2 Engine Size

Blackman and Haworth (2013) compared the crash risk and crash severity of motorcycles, mopeds and larger scooters in Australia. The results suggested that there is no considerable difference in the severity of reported crashes with respect to PTW types.

2.3.3 Demographic Variables

Research in various populations reported strong and significant relationship of demographic factors (such as age, gender, educational level, driving experience and so on) to risky driving (de Lapparent, 2006; Njå and Nesvåg, 2007; Vassallo et al., 2007; Waller et al., 2001; Romano et al., 2012; Mullin et al., 2000; Laapotti et al., 2001).Evans (1991- cited in Yagil, 1998) reported that gender is significant in predicting involvement in accidents; the rate of men's involvement in fatal road accidents is twice as high as women's.

2.3.3.1 Age and Gender

Age and gender of the driver have been found to have significant relationships with many factors such as risky driving and attitudes to traffic safety (Perez-Fuster et al., 2013; McKnight and McKnight, 2003; Akaateba and Amoh-Gyimah, 2013)*.* Young drivers, like all other drivers, may choose to adopt behaviours that they recognize to be risky when the balance between the perceived (possible) costs of the behaviour (e.g. penalties and crashes) and the perceived (possible) benefits of the behaviour (e.g. fun, or getting somewhere quicker) is judged to be favourable (Job, 1995 – cited in Hatfield and Fernandes, 2008). Studies have shown that young, male drivers are more involved in traffic accidents than young females (Arnett, 1990; Harré, Field and Kirkwood, 1996). Consistent with gender differences in illegal driving behaviour, females tend to express relatively greater compliance to traffic laws; whereas males have been found to comply more selectively with such laws (Yagil, 1998; Tseng, 2013).

Constantinou et al. (2011) reported that, current neurophysiologic evidence suggests that the brain, and particularly the prefrontal cortex regions associated with executive functions such as inhibition, reasoning and decision making, do not fully develop until

the age of 25 (Paus, 2005- cited in Constantinou et al., 2011). Therefore, young drivers may not be cognitively ready to manage the risks of such a complex task as driving, particularly under the influence of alcohol or fatigue, to both of which youngsters are more susceptible (Shope, 2006-cited in Constantinou et al., 2011).

Keall and Newstead (2012) examined the relationship between age of the driver and risky driving in New Zealand by comparing crash risk of PTW drivers and small car drivers. The results showed elevated risks for PTWs drivers in their age 20s. In crashes, the fatal or serious injuries of a PTW driver were eight times more than that for a car driver.

Schneider IV et al. (2012) analyzed crash data drawn from PTW crashes that occurred in the State of Ohio from 2006 to 2010 and found that younger drivers were more likely to be at-fault in the event of a crash and fault was generally found to decrease consistently with age, similar to the findings of Haque, Chin and Huang, (2009). Schneider IV et al. also found that, crash-involved parties who engaged in one high-risk behaviour were more likely to engage in other such behaviours (e.g., drunken driving, unhelmetted driving) as well, and this finding was consistent for both motorcyclists and other drivers. Moreover, Schneider IV observed that, drivers less than 20 years of age were 84.2 % more likely to be at-fault, followed by drivers 20–24 (42.6 % more likely), and 25–34 (14.2 % more likely), all in comparison to the at-fault likelihood of drivers aged 35 and above.

A Spanish study by Perez-Fuster et al. (2013) revealed that male drivers remained more likely to be the offender (committed at least one traffic offense at the moment previous to the crash) than women of age below 33, and this tendency disappeared in the 33–40 age groups, where males and females have same probability. However, it is

Inverted in the >40 age group, where females have higher probability of being offenders than males. Md Nor and Abdullah (2014) found that the male PTW drivers of Malaysia were more inclined to drive above the speed limit. In another study, Donate-Lopez et al. (2010) found that males have higher risks of accidents than females among Spanish drivers.

It is a surprising fact that novice drivers (aged 16–18 years) do not engage in as much risky driving as the slightly older drivers (aged 18–24 years; Harré, Brandt, and Awe, 2000; Jonah, 1990). These results are contradicted by Zhang, Yau and Chen, (2013) who found that, effect of drivers‟ age is not found to be significant on both traffic violations and accident severity.

Nordfjærn, Jørgensen and Rundmo (2010) found that demographic characteristics (age, gender and education) exerted stronger influences on driver attitudes and behaviour than the influence by some differences between rural and urban areas. In another study Chang and Yeh (2007) examined motorcycle use, riding behaviour and accident incidence of young motorcycle drivers in Taiwan and found that young, male drivers were more likely to disobey traffic regulations, while young drivers were more likely to be negligent of potential risk and motorcycle safety checks.

Rutter and Quine (1996) showed that young motorcyclists of the U K are more likely to be killed or seriously injured than older motorcyclists and accidents are associated with a particular pattern of behaviour-notably a willingness to break the law and violate the rules of safe riding. Parker et al. (1992) examined the four driving violations (speeding, drunken driving, close following and dangerous overtaking) among the drivers of England. Findings show that younger drivers found it more

difficult to refrain from committing the violations while the older drivers expressed the strongest intentions not to commit the violations. Regarding gender differences, males had less control over committing the violations (especially drink-driving) than females did.

2.3.3.2 Education of driver

Romano et al. (2012) examined the influence of demographic variables on drunken driving, in California and Florida and found that drivers with lower than 12 years of education were 1.62 times more likely to be involved in alcohol-related crashes than drivers with 12–14 years of education. This study also observed that those with greater than 15 years of education were significantly less likely to drive after alcohol consumption among those who met with a crash. Similar results were found in the studies of Hassen et al. (2011) that drivers of Mekele city, Northern Ethiopia with secondary or high school education showed higher risky driving than drivers with university or college education, consistent to the findings of Shinar (1993) that speeding behaviour is associated with less educated and lower income drivers. In another study at Ghana, Damsere-Derry et al. (2014) found that formal education is significantly associated with lower likelihood of drunken driving compared to drivers without any formal education. The likelihood of observing drunken driving is 1.8 times higher among drivers with no formal education than among those with basic education. This may be possibly because the drivers with formal education have a better understanding and apprehension of the impairing effects of alcohol.

Hasselberg, Vaeza and Laflamme, (2005) reported that the drivers of Swedish Population with low educational level (basic and secondary) were at greater risk of severe injuries, and showed excess risks of crashes of all kinds than the drivers with a higher education. This result was contradicted by Akaateba, Amoh-Gyimah, and

Amponsah (2015) who found no significant differences between various levels of education and drunken driving in Kumasi, Ghana, for the reason that drink driving is more likely a habitual activity that is developed regardless of one's level of formal education. In another study, Tseng (2013) explored speeding violations among 8129 adult male drivers of Taiwan in one-year period of 2008 and revealed that drivers with college education have less speeding tickets per million km compared to middle and less educated drivers (less than 9 years).

2.3.3.3 Experience of driver

The increased crash risk of young riders may be contributed to by the factors of less experience and immaturity (Yeh and Chang, 2009). Mullin et al. (2000) analyzed the PTWs age, experience, and injury over a three year period from February 1993 in New Zealand and found that drivers who had driven their current motorcycle 10 000 km or more had a 48% reduced risk compared to those who had driven their motorcycle less than 1000 km.

McCartt, Shabanova and Leaf (2003) found that crash involvement for each teenager's first year of licensure and first 3500 miles driven was substantially higher than it was during any of the next 11 months. Similarly, when viewed as a function of cumulative miles driven, the risk of a first crash or citation was highest during the first 500 miles driven after licensure. This result is contradicted by Hassen et al. (2011) who revealed that driving experience was not found as a predictor variable for risky driving.

2.3.4 Personality Traits

When we examine why young adults are more likely to engage in risky driving behaviour, research has assessed the possible role of additional factors, such as

personality traits. Personality trait is defined as the dimension of individual difference, the tendency to show consistent patterns of thoughts, feelings and actions. The personality traits that have been linked with risky driving are altruism, sensation seeking, normlessness and anxiety, aggressiveness and extraversion, neuroticism, conscientiousness, agreeableness and openness (Chen, 2009; Ulleberg and Rundmo, 2003; Falco et al., 2013; Brandau et al., 2011).

2.3.4.1 Altruism

Altruism is characterised by active concern for others (Ulleberg and Rundmo, 2003). Further, Ulleberg and Rundmo found among 1932 adolescents in Norway drivers scoring high on altruism were more likely to have a positive attitude towards traffic safety and were less likely to report risky driving in traffic. A possible explanation is that drivers scoring high on altruism are expected to show active concern for others which may cause more concern for others in traffic and thus reflects itself in less risky driving. In a similar study among young Taiwanese motorcyclists, Chen (2009) revealed a direct effect of altruism on risky driving, which would imply that a driver who had the characteristic of considering the interests of others tended to reduce his/her risky driving. Studies of Dahlen et al. (2005) and Machin and Sankey (2008) have found that sensation seeking and altruism are significantly correlated to driving behaviour. Rushton et al. (1986) found that women had higher scores than men on altruism. In another study, Ge et al. (2014) found that altruism was significantly negatively correlated to drunken driving indicating that altruists were less likely to drive while intoxicated than those who were less concerned about others.

2.3.4.2 Sensation Seeking

Zuckerman (1994), defined sensation seeking as "seeking of varied, novel, complex and intense sensations and experiences, and the willingness to take physical, social,

legal and financial risks for the sake of such experience". Sensation seeking develops during early adolescence, builds up between ages of 10 and 15, peaks around the age 20 and declines or remains stable thereafter (Arnett, 1994; Ball, Farnill, and Wangeman, 1984; Roberti, 2004; Rosenbloom and Wolf, 2002; Steinberg et al., 2008). Higher levels of sensation seeking were found among adolescents than adults (Arnett, 1994) and among males than in females, may be due to biological reasons, as testosterone is higher among males (Zuckerman et al., 1978, cited in Arnett, Offers and Fine, 1997). Sensation seeking scores positively correlated with a variety of risky behaviours, such as injury proneness, financial risk taking and smoking (Zuckerman, 1994 - cited in Jonah, 1997), as well as risky driving (Jonah, 1997).

In a Norwegian study, Ulleberg and Rundmo (2003) found that high scores on sensation seeking were related to negative attitudes towards traffic safety and risky driving. Among Taiwanese motorcyclists, Chen (2009) found indirect effect of sensation seeking through safety attitudes on risky driving. A plausible explanation for this is that sensation-seekers were expected to seek excitement and stimulation in traffic, which is reflected in risky driving.

In another study among Norwegian drivers, Iversen and Rundmo (2002) showed that there was a tendency for both sensation seekers and normless drivers to report more speeding and rule violations. This study also found that sensation seekers were more involved in risky driving and resultant accidents which suggest that sensation seekers do not only drive faster and commit traffic rule violations; but also, be more involved in road crashes than others. Though this study investigated the influence of locus of control, it was generally not associated with risky driving.

In a literature review, Jonah (1997) observed that sensation seeking has been strongly related to report risky driving among men. The author also found high sensation seekers

might not perceive certain risky driving as being risky, because they feel that they can speed, follow closely, or drive after drink and still drive safely as a result of their perceived superior driving skills. In another study at Taiwan, Wong, Chung and Huang (2010) found that sensation seekers of PTW riders with low affective risk perception and high riding confidence are highly comfortable with unsafe riding and interested in the utility gained from it, making them highly prone to risky riding. This study also found that riders with extremely confident, experienced and skilful risky riding habits are highly aware of traffic conditions, and pay more attention to traffic in order to protect themselves.

2.3.4.3 Normlessness

Ulleberg and Rundmo (2003) stated that normlessness is the belief that socially unapproved behaviours are required to achieve certain goals and is associated with risky driving behaviour. They also found that normless drivers are assumed to have low barriers towards socially unapproved behaviour and rule violation which may mirror themselves in traffic. In a similar study, Chen (2009) found that, anti-social behaviours of normless drivers are reflected in risk-taking attitudes towards rule violation, and speeding, consistent with the findings of earlier researchers (Iversen and Rundmo, 2002; Iversen and Rundmo, 2004; Oltedal and Rundmo, 2006).

Among Turkish and Iranian drivers, Nordfjarn et al. (2014) found that normlessness had the strongest relations to driver attitudes, illustrating that lower levels of this trait predict more favourable attitudes to traffic safety. Normless drivers involve in risky driving (e.g., speeding) to serve specific purposes (e.g., a need to reach a work meeting in time). Further, the authors stated that the respondents who scored high on

normlessness were involved in more risky driving, accidents and near-accidents. In another study, Oltedal and Rundmo (2006) found that normless males report most risky driving.

2.3.5 Family climate for road safety

In some situations, individuals may take more risks, evaluate risky behaviour more positively, and make more risky decisions when they are with their peers than when they are alone and the effects of peer presence on both risk taking and risky decision making vary as a function of age (Gardner and Steinberg, 2005). Family climate for road safety include family involvement and commitment to safety of PTW driver and social or peers' norms and self-efficacy.

In some situations, individuals may take more risks, evaluate risky behaviour more positively, and make more risky decisions when they are with their peers than when they are alone and the effects of peer presence on both risk taking and risky decision making vary as a function of age (Gardner and Steinberg, 2005). Family climate for road safety include family involvement and commitment to the safety of PTW driver and social or peers' norms and self-efficacy.

2.3.5.1Family involvement

In a study in Israel, Taubman-Ben-Ari, et al. (2014) found that parents have a significant role in teens risky driving, in shaping offspring's driving patterns both by their own driving style and by the ways they interpret norms and values regarding reckless driving. This study also found that young drivers perceived their parents to be role models for safe driving, more open for communication and convey clearer messages regarding safe driving, to monitor their driving habits tended to report taking risks less frequently, be more personally committed to safety, and drive more carefully.

This study also revealed that parents" safe driving was found to reduce the offspring's risky driving, consistent with Taubman-Ben-Ari and Katz-Ben-Ami (2013).

Hartos et al. (2000) analyzed data from 300 adolescents licenced two years or less and found that low parental monitoring and control were related to risky driving and traffic violations; and road crashes among the teen and violations were about four times more likely and crashes were almost seven times more likely with lenient restrictions related to frequency of friends as passengers. Overall, the findings suggest that adolescent driving problem is related to parenting practices. Similar findings were found in Taubman-Ben-Ari, et al. (2014) and Taubman-Ben-Ari, Mikulincer, and Gillath (2005) that both parents (mother and father) reckless or careful driving styles are reflected in their offspring's driving. In another study, Bianchi and Summala (2004) confirmed that parents risky driving influenced their children's driving and the relationship between children's and parents risky driving were positive and significant, pointing out that the more errors and violations occur among parents, the more of such specific behaviour can be expected from their children.

2.3.5.2 Commitment to Safety
Commitment simply means you'll say what you'll do and do what you said. Commitment to road safety implies obeying traffic laws and considerate driving. Personal commitment to safe driving can be designed to measure the drivers" sense of responsibility on the road and commitment to safe and careful driving. Taubman-Ben-Ari and Katz-Ben-Ami (2013) examined the relationship of commitment to safe driving with risky driving of young drivers in Israel and found that, young drivers

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Who did not perceive their parents to be committed to road safety were reported more reckless and less committed to safety themselves. This study also revealed that young women are more committed to road safety than men.

2.3.6 Safety Attitude

Fernandes, Job and Hatfield (2007) stated that a belief that speeding increases the chance of crashing, along with a negative evaluation of crashing, would amount to a negative attitude toward speeding and the belief that speeding increases the chance of arriving at a specified time, along with a positive evaluation of arriving on time would amount to a positive attitude toward speeding. The researchers also found that (1) speeding was significantly predicted by specific attitude to speeding and authority rebellion (2) attitudes appear to be the strongest predictors of risky driving, even after controlling the effects of age, gender, and personality traits.

Ulleberg and Rundmo (2003) found that attitude towards traffic safety was the only variable with a direct effect on risky driving and it seemed to function as a mediating variable in the relation between personality traits and risky driving. In a similar study, Chen (2009) identified a significant relationship between attitudes toward traffic safety and risky driving among young Taiwanese motorcyclists. The results showed that there are different aspects of attitudes and different influences on risky driving behaviours. Therefore, attitudes towards traffic safety aspects serve as antecedents of future unsafe behaviour in traffic. Similar findings were also found in Golias and Karlaftis (2002); Iversen (2004) and Iversen and Rundmo (2004) that attitudes towards rule violations and speeding in traffic influenced risky driving. Ulleberg and Rundmo (2003) and Chen (2009) considered attitude variables towards traffic safety

as traffic flow vs. rule obedience, speeding, and fun-riding. In another study, Sukor et al. (2016) revealed that attitude toward and desire to speed are likely to affect speeding behaviour. Speeding is also strongly triggered by two perceptions: (1) the feeling that it is difficult to have personal control over speeding and (2) the feeling that other riders also speed.

Machin and Sankey (2008) found that driver's attitudes about the social acceptability of speeding or risky driving may be the strongest influence on how likely that driver is to speed or adopt risky driving. In another study, Clarke et al. (2002) showed that attitudinal factors are at least as important as skill factors when the causation of young driver accidents is being considered. Mirzaei et al. (2014) reported that it is not knowledge and standard traffic education that improve the behaviour of drivers in terms of safety; it is how such education is registered as an attitude, i.e. translating what is learned into actions.

2.4 INTERVENTIONS ON RISKY DRIVING OF PTW DRIVERS

Growing PTW traffic makes it imperative to adopt safety interventions targeting this mode of transport. Statistical data on PTW involved crashes, suggest that improving the safety of PTWs should be a shared responsibility. All relevant stake-holders need to be actively involved in the process of implementing a shared road safety strategy which includes safer behaviour of all road users, safer infrastructure and vehicles with enhanced safety features (Van Elslande, 2014).

2.4.1 Graduated Driving Licence (GDL)

According to Hedlund, Shults and Compton (2003) Graduated driver licensing (GDL) is a three-phase licensing system in the United States of America, for novice drivers

consisting of a learner's permit, a provisional licence, and a full licence. The essential features of GDL are that a learner's permit allows driving only while supervised by a fully licensed person, a provisional licence allows unsupervised driving under certain restrictions, and both the learner's permit and the provisional licence must be held for a specified minimum period of time to obtain a full licence. Hedlund (2007) reported that crashes involving teenage drivers after the implementation of GDL in the United States have decreased substantially over the years 1995-2005. Fell et al. (2011) reported that GDL laws have significantly reduced fatal crash rates of 16 and 17 year old drivers. Further, this study predicted that states that adopt a basic GDL law can expect a decrease of 8 to 14% in the proportion of 16 and 17 year old drivers involved in fatal crashes (relative to 21 to 25 year old drivers), depending upon other existing laws that affect novice drivers.

In Kerala, there is a two stage licensing system with a learner's licence for six months after qualifying a written test based on road safety during which the driver should operate the vehicle under the supervision of a licence holder. Thereafter a full licence is issued for a period of 20 years or up to the age of 50 (whichever is earlier) after qualifying a practical test on road and ground.

Although Verma et al. (2011) have put forward recommendations for age and driver training, particularly formal and informal pre-licensing training, and traffic law enforcement to novice drivers of India, till now, it is not implemented.

2.4.2 Changing (Shaping) the Safety Attitudes

After analyzing the predictive nature of variables leading to risky driving, recent literature highlights the interaction of these variables. The safety attitudes towards reckless driving have been found out as the significant predictor of risky driving (e.g.,

Fernandes, Job and Hatfield, 2007; Iversen, 2004). Changing the attitude (through safety campaigns) is one of the ways to change human behaviour, i.e., by changing the attitude to reckless driving it should be possible to reduce the number of risky drivers (Muzikante and Reņģe 2011). In another research, De Pelsmacker and Janssens (2007) developed speeding behaviour model in which the relevance of attitude towards speeding, attitude towards speed limits are assessed. According to this study „if most of the drivers do not care about speeding or speed themselves, there is not really an incentive for the individual to change his or her attitude towards speeding". Obviously, individuals will not change their attitude towards speeding as long as they do not perceive that majority of others change or are in favour of it. Therefore, campaigns should be primarily focused on changing the perception of what the majority of drivers find evident and important. Hassan and Abdel-Aty (2013) reported that the drivers' attitudes about safety are formed at an early age and hence suggested that more education programs for young drivers may help in reducing their crash risk.

Falk (2010) conducted two safety intervention studies: 193 men, 18–20 years old with licence participated in the first study and 149 men, 18–19 years old with licence participated in the second study; and found a significant decrease in self-reported risky driving after answering two sets of questionnaires regarding risky driving and safety attitudes during first week and after five weeks' time. The results of this study were discussed in terms of the "question-behaviour effect", that is, questioning aperson about a definite behaviour can influence his future performance of that behaviour. This study concluded that, answering the questionnaire served as an intervention that made attitudes more accessible and led to a polarization towards stronger disapproval of traffic violations, which in turn reduced risky driving. In a

similar study Mann and Lansdown (2009) found that a change in safety attitude is feasible among adolescents by making them answer two sets of questionnaires consisting of risk taking attitude, risky behaviour including drunk driving first before a pre-driver awareness campaign and the second one after a lapse of 6 months. The authors identified males as „higher risks" on the roads compared to females, and it was encouraging to see that their attitudes towards the acceptability of driving faster than the speed limit, drink-driving and driving without helmet had reduced (and had thus become less risky) over the course of the study.

2.4.3 Shaping the personality traits

Although personality traits have been found to be relatively stable across time, and there is also evidence for their having a biological basis (Loehlin, 1992), shaping of sensation seeking may be possible by driver education so that it addresses directly to adolescents' propensities for sensation seeking (Arnett Offers and Fine, 1997). Direct intervention to change the sensation seeking of the drivers would not bring the desired effect. Instead the messages with a high sensation value, having ability to elicit sensory, affective, and arousal response in traffic safety campaigns, which are more appealing and efficient for high sensation-seekers could be used (Ullberg and Rundmo, 2003; Palmgreen et al., 1991- cited in Green et al., 2000). In another study, Roberti (2004) suggested that recommending, appealing, non-risky forms of sensation seeking to individuals that once engaged in risky behaviours is one way of reducing negative health consequences.

González-Iglesias, Gómez-Fraguela and Luengo (2014) found that peers' norms and self-efficacy mediated between driver's sensation seeking and drunk driving significantly, which helped to reduce drunk driving by shaping (changing) peers'

norms and self-efficacy. In another study the link between parental bond and risky driving was mediated by adolescent's sensation seeking (Smorti and Guarnieri, 2014) fully among male and partially among female PTW drivers.

Arnett, Offers and Fine (1997) suggested that the basis of the risk taking tendency lies partially in sensation seeking, particularly adolescent boys, who report stronger tendencies than adolescent girls on this trait. Many adolescents are attracted to the use of automobiles, (as it provides a variety of intense experiences, including driving at high speeds and racing other vehicles) in part for the sensation seeking thrill. Although it is unrealistic to expect that interventions can successfully reduce levels of sensation seeking it may be more useful to attempt to teach adolescents alternative ways of discharging their sensation seeking. Reducing the sensation seeking may be possible by driver-education so that it addresses directly to adolescents" propensities for that trait.

2.5 OBSERVATIONS FROM LITERATURE REVIEW AND MOTIVATION FOR CURRENT RESEARCH

2.5.1 Observations from literature review

PTWs are dynamically unstable vehicles; therefore, the possibility for a crash and fatality involved by a PTW is higher than that of other vehicles. Risky driving has been identified as an important contributor to road crashes which is usually reflected on activities such as speeding, disobeying traffic signals, give-way or stop sign, non-compliance to overtaking restrictions or pedestrian crossing, making illegal turns, maintaining short gaps with the precedent vehicles and so on. Drunken driving, cell phone use while driving, driving without helmet, negligence of potential risk, aggressive driving, reckless driving; risk taking due to self assertiveness, speeding and driving while fatigued and negligence of vehicle examination are other types of risky

driving. Drivers who engaged in one high-risk behaviour were more likely to engage in other such behaviours (e.g., drunken driving, driving without helmet).

There are many studies relating risky driving behavior and its influencing factors. In addition to engine size other factors influencing risky driving behavior are (i) demographic variables such as age, gender, education level and driving experience and so on (ii) safety attitudes (attitude to rule obedience and speeding, attitude to use helmet, attitude to drink and drive and attitude to use cell phone while driving and specific attitude to involve in a specific risky driving: e.g., urgency influence dangerous overtaking) (iii) personality traits (altruism, sensation seeking, normlessness and anxiety and aggressiveness and extraversion, neuroticism, conscientiousness and agreeableness) and (iv) family climate for road safety (family involvement, commitment to safety and social or peers' norms and self-efficacy).

Young male drivers are prone to risky driving behavior due to their greater risk propensity, whereas less educated drivers are more likely to be involved in different types of risky driving compared to drivers college or university educated, because the drivers with formal education have a better understanding and apprehension of the impairing effects of a road crash. Female and older drivers exhibit safe driving mostly due to their law-abiding nature. Drivers with high scores of altruism observe high level of safe driving in the traffic, whereas sensation seekers and normless drivers show risky driving behavior. Also, drivers with high scores of safety attitudes and family climate for road safety show a negative approach to risky driving behavior.

Studies on road safety suggest that improving the safety of PTWs should be a shared responsibility. All relevant stake-holders need to be actively involved in the process of implementing a shared road safety strategy. Safety interventions targeting PTW

drivers' risky driving, such as Graduated driver licensing (GDL), drive to the usage of helmets, changing or shaping the safety attitudes and personality traits promise reduction of risky driving behaviour.

2.5.2 Motivation for current research

Review of literature revealed that the influence of personal factors of driver (such as demographic variables, safety attitudes, personality traits and family involvement and commitment to safety) on some of the risky driving behaviours (such as drunken driving, cell phone use while driving, driving without helmet, negligence of potential risk, dangerous overtaking; risk due to self assertiveness, speeding and rule violation and negligence of vehicle examination) are reported from different parts of the world. Also, influence of demographic variables on safety attitudes are seen in the literature. The mechanism with which the safety attitudes and characteristics of drivers works together contributing to risky driving behaviours are rarely examined. Also, literature on the predictive capacity of these personal factors on risky driving behaviours is scarce. The mediating role of safety attitudes and personality traits on the link between demographic variables and risky driving behaviours are seldom explored. However, it is known that these findings do not remain universally stable across various cultures and socio-economic differences. There is scarcity of literature on such studies from a developing country like India and particularly from the State of Kerala which is ranked as most literate State in the country.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

The purpose of this chapter is to serve as an introduction to other chapters which present the data collection, processing and the results of the analyses that were conducted. Consequently, this chapter is a demonstration of the overall methodological approach that will lead to the accomplishment of the aim of the thesis. Therefore, this chapter provides the methodology followed in this research on risky driving behaviour and its influencing variables of PTW drivers of Kerala.

3.2 DESIGN OF MEASURING INSTRUMENTS

The primary objective of this chapter is to identify different types of risky driving behaviour and its influencing factors from literature review. Numerous studies reveal various types of risky driving behavior such as:

(1) Risky driving due to self assertiveness

(2) Risky driving due to speeding

(3) Risky driving due to rule violation

(4) Drunken driving

(5) Helmet usage

(6) Cell phone use while driving

(7) Negligence of potential risk

(8) Dangerous overtaking

(9) Tailgating

(10) Turning without using indicators

(11) Aggressive driving

(12) Driving while fatigued

(13) Negligence of vehicle examination

(14) Non-compliance to pedestrian crossing

(15) Disobeying traffic signals

(16) Making illegal turns.

Many studies reveal various variables influencing the risky driving behaviour. A few are:

(1) Speeding

(2) Engine size

(3) Demographic variables: age, gender, education, occupation, driving experience, income, marital status and so on

(4) Personality traits: altruism, sensation seeking, normlessness, anxiety, locus of control, aggressiveness, neuroticism, extraversion, conscientiousness, agreeableness, openness and so on

(5) Safety attitudes: attitude to (i) traffic flow vs rule obedience (ii) speeding (iii) fun riding (iv) use helmet (v) drunken driving (vi) cell phone usage while driving and

(6) Specific attitude to involve in a specific risky driving: (e.g., attitude to overtake dangerously)

(7) Family climate for road safety: family involvement, commitment to safety

(8) Social factors: social or peers' norms and so on.

Discussion was conducted to identify different behavior of drivers, specifically that of PTW, with road safety professionals including the officers of traffic police departments, motor vehicle departments, motor accident and crime tribunals of Kerala as well as safety academicians, instructors of driving schools, experienced drivers of all types of vehicles and other road users. Based on the discussion, the current study selected the following types of risky driving behaviour and the independent variables which are supposed to influence the selected types of risky driving behaviour.

Types of risky driving behaviour selected are:

(1) Risky driving due to self assertiveness

(2) Risky driving due to speeding

(3) Risky driving due to rule violation

(4) Drunken driving

(5) Cell phone usage while driving and

(6) Negligence of vehicle examination, which is renamed as "Negligence of bike examination".

The selected influencing variables of risky driving behaviour are:

(1) Demographic variables: age, gender and education

(2) Personality traits: altruism, sensation seeking and normlessness

(3) Safety attitudes: attitude to (i) traffic flow vs rule obedience (ii) speeding and (iii) helmet use

(4) Family climate for road safety: family involvement and commitment to safety.

Many investigators (for e.g., Lin et al., 2003; Rutter and Quine, 1996; Romano et al., 2012) have studied influence of age, gender and education level on risky driving, whereas, Chen (2009) and Ulleberg and Rundmo (2003) have studied influence of

safety attitude variables and personality traits, such as altruism, sensation seeking, anxiety and normlessness on risky driving. In another study, Fernandes, Job, and Hatfield (2007) examined the influence of safety attitudes and personality traits together with demographics on risky driving. Taubman-Ben-Ari and Katz-Ben-Ami (2013) and Bianchi and Summala (2004) have studied the influence of family involvement of the driver in shaping their risky driving behaviour. Commitment to road safety is an issue, which influences the risky driving of drivers. Taubman-Ben-Ari, et al. (2014) examined this aspect also in their study on family climate for road safety (FCRS).

Few studies attempted to integrate variables from these different research traditions. The influence of safety attitudes and personality traits are rarely studied together with demographic variables as well as the family climate for road safety on risky driving. The present study attempts to integrate these four research traditions, namely the demographic approach, the safety attitude, personality approach and family climate for road safety in order to understand the mechanisms underlying the risky driving behaviour of the PTW drivers.

This study demands a rigorous research methodology with reliable and valid instruments. This can be achieved only by measuring the PTW drivers' self reported risky driving, safety attitudes, personality traits and family climate for road safety in addition to their demographic details. A survey using questionnaire is widely acknowledged as an effective tool for assessing the perceptions of individuals on a particular subject. A study using such an instrument can enhance the process of theory building on road safety and the findings of the study can be effectively used by road safety managers and practitioners for the betterment of road safety programmes.

3.2.1 Sampling and Data Collection

The questions used for this research are closed questions, as closed questions allow for answers within a finite set and are used to collect both factual information such as gender and age, and data related to different types of risky driving and its influencing variables thus providing a high-level of control over the questionnaire (Oppenheim, 1996). When closed questionnaires were designed for this research that sought an opinion or attitude a Likert scale was used, with the scale balanced around the midpoint. The questionnaires were designed to reduce demand characteristic bias, which can occur when respondents want to be good participants and try to give the answers that they feel the researcher wants (Broughton, 2007).

3.2.2 Questionnaire Surveys

A 70-item questionnaire, covering areas of risky driving behaviour viz., risky driving due to (1) self assertiveness (2) speeding (3) rule violation and (4) drunken driving (5) cell phone usage while driving and (6) negligence of bike examination and its influencing factors viz., (1) altruism (2) sensation seeking (3) normlessness and attitude to (1) traffic flow vs rule obedience (2) speeding (3) helmet usage and (7) family involvement (8) commitment to safety, was prepared from previous studies (Ulleberg and Rundmo, 2003; Horwood andFergusson, 2000; Hassan and Abdel-Aty, 2013; Chang and Yeh, 2007; Norris and Myers, 2013; Taubman-Ben-Ari and Katz-Ben-Ami, 2013). Using these 70 items, a pilot survey was conducted on a selected sample of 100 PTW drivers from an Engineering College, where mixed population of all districts of Kerala are available to get feedback about the clarity of items. This instrument has been refined based on findings of the pilot study and suggestions of the experts. It was decided to give the questions in English as well as the local language

Malyalam. The respondents were asked to give their preference on a 5 point Likert scale (strongly disagree, disagree, neutral, agree and strongly agree) in order to evaluate the subject's agreement with each item. The six-page questionnaire ready for administration consisted of two sections; the demography and questionnaire. The questions were jumbled and arranged in a random order in the questionnaire. The theme of the instrument along with the request letter, demographic section and questionnaire section is presented in Appendix.

3.2.3 Procedure

Before distributing the questionnaire, trained assistants explained the purpose and requested the cooperation of the respondents for a sincere answer to the queries. Then approximately 150–200 questionnaires were distributed in each of the 14 districts of the State. The questionnaire was given to the PTW drivers among: (a) faculty, non-teaching staff and students of selected colleges (b) employees of public and private offices (c) commuters of trains (d) workers of various industries and work sites and (e) in social gatherings. To encourage the respondent, no identifying information request was included in the questionnaire. Time required to answer the questionnaire was approximately 40 min.

3.2.4 Sample

A total of 2250 questionnaires were distributed among the PTW drivers in 14 Districts of State of Kerala and 1353 completed questionnaires were received. For inadequacy of demographic details 54 questionnaires were dropped. The remaining 1299 samples were used for analysis (1089 male and 210 female with Mean = 0.84 and SD = 0.37; aged 18–63 years, with Mean = 30.06 years and SD = 10.96). The data collection was completed in 6 months in the year 2014. The overall response rate was 57.73%.

3.2.5 Data Analysis

Drivers were grouped on the basis of gender, age (18– 22 years, 23–29 years, 30–39 years, 40–49 years and 50–63 years) and education level (Grade10, Grade12, degree, and above degree). Statistics based on age, gender and education level of the respondents is presented in Table 3.1.

Table 3.1 Descriptive statistics

	Male N = 1089 (83.83%)	Female N = 210 (16.17%)	Total N (%)
Age			
18-22	346 (26.63)	104 (8.00)	450 (34.63)
23-29	282 (21.71)	52 (4.00)	334 (25.71)
30-39	213 (16.40)	33 (2.54)	246 (18.94)
40-49	149 (11.48)	16 (1.23)	165 (12.71)
50-63	99 (7.62)	5 (0.39)	104 (8.01)
Total	1089 (83.83%)	210 (16.17%)	1299 (100%)
Education Level			
10 Grade	199 (15.32)	17 (1.31)	216 (16.63)
12 Grade	320 (24.63)	30 (2.31)	350 (26.94)
Degree	406 (31.26)	119 (9.16)	525 (40.42)
Above Degree	164 (12.63)	44 (3.38)	208 (16.01)

Results show that number of female respondents is low (16.17% of the total) compared to male drivers, similar to the representation of females on road. Drivers educated up to degree are over represented than other grades of education. All analyses were conducted using the Statistical Package for the Social Sciences (SPSS).

3.2.6 Validity analysis

Validity is defined as the extent to which any measuring instrument measures what it is intended to measure (Carmines and Zeller, 1990). Different validity terms are used to illustrate the various aspects of validity. The comprehensive list of validity types that are mentioned in textbooks and research literature include face, content, convergent, and criterion-related validity. The proposed instrument has been tested

for validity, so that it could be used for meaningful analysis. The three aspects of validity namely content validity, face validity and convergent validity have been tested as explained below.

3.2.6.1 Content validity

Content validity of an instrument refers to the degree to which it provides an adequate depiction of the conceptual domain that it is designed to cover (Hair et aI., 1998). In the case of content validity, the evidence is subjective and logical rather than statistical. Establishment of content validity warrants sound logic, good intuitive skills and high perseverance on the part of the instrument designer (Kaplan and Scauzzo, 1993). Content validity can be ensured if the items representing the various constructs of an instrument are substantiated by a comprehensive review of the relevant literature (Bohrnstedt, 1983). The present instrument has been developed on the basis of a detailed review and analysis of the prescriptive, conceptual and empirical literature, so as to ensure the content validity.

3.2.6.2 Face validity

Generally, a measure is considered to have 'face validity' if the items are reasonably related to the perceived purpose of the measure (Kaplan and Scauzzo, 1993). In face validity, one looks at the measure and judges whether it seems a good translation of the construct under study. Face validity is also a subjective and logical measure similar to content validity. The face validity can also be established through review of the instrument by experts in the field (Hair et aI., 1998).

The present questionnaire has been discussed with senior road safety professionals and senior professors in safety studies. They have been briefed about the purpose of the study and its scope. They were requested to critically examine the questionnaire

and give objective feedback and suggestions with regard to comprehensiveness, coverage, redundancy level, consistency and number of items in each variable. After considering each item in detail necessary changes were made by simplifying, rewording, removing or replacing some of them. In the initial questionnaire there were 70 items. Based on the feedback from experts 9 items were dropped and 61 were retained in the questionnaire for the study. So, in the present study the content validity and face validity have been assured in the initial stages of questionnaire development itself.

3.2.7 Reliability Analysis

Reliability of an instrument is defined as the extent to which any measuring instrument yields the same result on repeated trials (Cannines and Zeller, 1990). There are several methods to establish the reliability of a measuring instrument. These include test-retest method, equivalent forms, split-halves method, and internal consistency method. Of all these methods, the internal consistency method isconsidered to be the most effective method, especially in field studies. The advantage of this method is that it requires only one administration, and consequently this method is considered to be the most general form of reliability estimation (Sureshchandar et al., 2001; Vinodkumar, 2005).

The internal consistency is estimated using a reliability coefficient called Cronbach's alpha (α) (Cronbach, 1951). An alpha value of 0.70 or above is considered to be the criterion for demonstrating strong internal consistency of established scales (Nunnally, 1978). In the case of social research, alpha value of 0.60 or above is also considered as significant (Hair et al., 1998). The reliability of the scale used in the current study is tested by computing Cronbach's alpha (α) value for all factors. This procedure resulted in removal of 5 items from the instrument and the final questionnaire contained 56 items. For further analysis these 56 items are used in the subsequent chapters. To obtain the reliability of the variables of study Cronbach's Alpha (α) was run and the results are

presented in Table 3.2 and 3.3.It can be seen from the tables that all the factors have Cronbach's alpha value above 0.7, except for cell phone usage and sensation seeking for which Cronbach's alpha values are 0.66 and 0.67 respectively, which testifies the reliability of the instrument.

Table 3.2 Statistics of the risky driving variables with Cronbach's Alpha (α)

Variables	No. of items	Mean (SD)	Cronbach's Alpha (α)
Risky Driving			
Risk (self assertiveness) RA	5	2.25(1.00)	0.82
Risk (speeding) RS	5	2.66(0.98)	0.78
Risk (rule violation) RV	4	2.50(1.00)	0.73
Drunken driving DD	2	2.26(1.23)	0.77
Cell phone usage CU	4	2.49(0.95)	0.66
Negligence of Bike Examination NE	4	2.77(1.02)	0.73

Table 3.3 Statistics of the drivers" personal factors with Cronbach's Alpha (α)

Variables	No. of items	Mean (SD)	Cronbach's Alpha (α)
Attitudinal variables			
Attitude to obey rules AR	5	2.81(0.96)	0.76
Attitude to speeding AS	4	2.98(1.02)	0.70
Attitude to use helmet AH	3	3.64(1.12)	0.81
Personality traits			
Altruism AL	4	3.60(0.97)	0.81
Sensation seeking SS	4	3.04(0.94)	0.67
Normlessness NM	4	2.95(0.98)	0.72
Family climate for road safety			
Family involvement FI	4	3.58(1.02)	0.75
Commitment to safety CS	4	3.44(1.07)	0.71

3.3 STATISTICAL ANALYSIS USED IN THIS RESEARCH

3.3.1 T-tests and analysis of variance (ANOVA)

T-tests and analysis of variance (ANOVA) are widely used statistical methods to compare group means. For example, the independent sample t-test enables the

researcher to compare safety attitude between male and female drivers. For a t-test, the mean of a variable to be compared should be substantively interpretable. Technically, the left-hand side variable to be tested should be interval or ratio scaled (continuous), whereas the right-hand side variable should be binary (categorical). The t test can also be used to compare the proportions of binary variables. The mean of a binary variable is the proportion or percentage of success of the variable (Park, 2003). In the context of the current study, t test is used to compare the variables on the basis of gender. One way ANOVA (Analysis of Variance) can compare more than two groups by using F statistic to test if all groups have the same mean (Park, 2003). In the context of the current study, One way ANOVA is used to compare the variables of this study on the basis of age groups and educational groups.

3.3.2 Hierarchical Regression

Researchers are often interested in testing theoretical assumptions and examining the influence of several predictor variables in a sequential way, such that the relative importance of a predictor may be judged on the basis of how much it adds to the prediction of a criterion, over and above that which can be accounted for by other important predictors. In order to determine the important predictors, hierarchical regression is a suitable tool, which involves theoretically based decisions for how predictors are entered into the analysis (Petrocelli, 2003). In other words, hierarchical regression is a way to show if variables of interest explain a statistically significant amount of variance in the Dependent Variable after accounting for all other variables. In the context of the current study, multiple hierarchical regression is used to determine the prediction of risky driving behaviour from the selected list of independent variables.

3.3.3 Mediation Modelling

Consider a variable X that is assumed to cause another variable Y. The variable X is called the *causal variable* and the variable that it causes or Y is called the *outcome*. Path *c* in the model shown Fig 1 is called the *total effect*. The effect of X on Y may be mediated by a process or mediating variable M and the variable X may still affect Y. The mediated model is shown in Figure 3.2 below.

X   c   Y
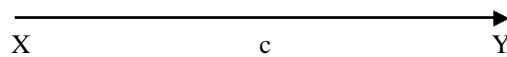
Fig 3.1 Unmediated model

M

a   b

X   Y

c'
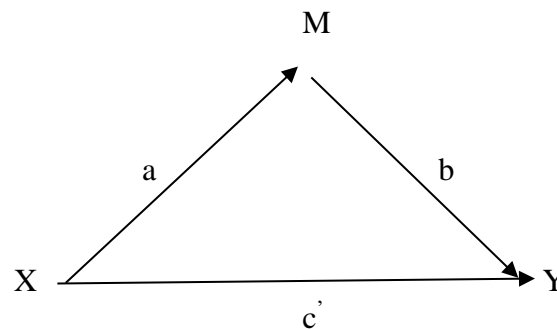
Fig 3.2 Mediated model

(*Complete mediation* is the case in which variable X no longer affects Y after M has been controlled, making path *c'* zero. Path *c'* is called direct effect and the product of *a* and *b (a*b)* is called indirect effect, so that total effect, $c = c' + ab$. Partial mediation is the case in which the path from X to Y *(c')* is reduced in absolute size but is still different from zero when the mediator is introduced (Baron and Kenny (1986).

3.4 RELATIONSHIP BETWEEN RISKY DRIVING ANDITS RELATED VARIABLES

The Literature review revealed that (1) the demography (age, gender and education) (2) personality traits (altruism AL, sensation seeking SS and normlessness NM) and (3) attitude to (rule obedience AR, speeding AS and use helmet AH) and (4) family climate for road safety (family involvement FI and commitment to safety CS)

individually and combined together make a direct or an indirect relationship with risky driving where there is a lot of interdependence among its dimensions or factors. To get a picture of the relationship between the risky driving and its influencing factors a bivariate correlation analysis was performed. The results of the correlation analysis are summarized in Table 3.4 and 3.5.

3.4.1 Correlation of Demography with study variables

Table 3.4 displays the correlation of demographical variables (age, gender and education) with risky driving, attitude and family climate for road safety. Results revealed significant and weak correlation between gender of driver and all types of risky driving behaviour except negligence of bike examination NE. It was also found that gender of the driver has significant correlation with attitude variables and family involvement.

Table 3.4 Correlation of demography with study variables

	Gender	Age	Education
Risk (self assertiveness) RA	0.08**	-.13**	-.26**
Risk (speeding) RS	0.16**	-.12**	-.20**
Risk (rule violation) RV	0.09**	-.09**	-.28**
Drunken driving DD	0.16**	NS	-.24**
Cell Phone Usage CU	0.09**	-.10**	-.14**
Negligence of Bike Examination NE	NS	NS	-.23**
Attitude (traffic flow vs obedience) AR	-.10**	0.12**	0.27**
Attitude (speeding) AS	-.09**	0.11**	0.21**
Attitude to use Helmet AH	-.07*	NS	0.30**
Family Involvement FI	-.09**	NS	0.28**
Commitment to safety CS	NS	NS	0.26**

** p < .01; NS: No Significance

Age of the driver has significant correlation with all types of risky driving behaviour except drunken driving and negligence of bike examination NE, indicating that young drivers are associated with these types of risky driving behaviour. Also, it was found that age of the driver has significant correlation with AR and AS and no significant correlation with AH and FI and CS. Coming to the correlation of education with the

study variables, education has significant correlations with all types of risky driving behaviour, attitudinal variables and family climate for road safety (FI and CS).

3.4.2 Correlation of Personality, Attitudinal and Family climate for road safety Variables with Risky Driving Behaviour

Bivariate correlations were computed to explore the interrelationships among six types of risky driving behaviours, personality traits (altruism AL, sensation seeking SS and normlessness NM) and attitudes to (rule obedience AR, speeding AS and use helmet AH) and family climate for road safety (family involvement FI and commitment to safety CS). The results are displayed in Table 3.5.

Table 3.5 Correlation of personality, attitudinal and family climate for road safety variables with risky driving behaviour

Factor	AL	SS	NM	AR	AS	AH	FI	CS
RA	-.61**	0.60**	0.64**	-.54**	-.58**	-.59**	-.63**	-.53**
RS	-.60**	0.56**	0.62**	-.57**	-.59**	-.57**	-.54**	-.45**
RV	-.63**	0.59**	0.64**	-.58**	-.61**	-.60**	-.61**	-.54**
DD	-.61**	0.58**	0.59**	-.48**	-.53**	-.57**	-.60**	-.60**
CU	-.42**	0.50**	0.49**	-.41**	-.51**	-.42**	-.44**	-.47**
NE	-.58**	0.51**	0.46**	-.45**	-.52**	-.58**	-.67**	-.58**

** $p<.01$; RA: risky driving (self assertiveness); RS: risky driving (speeding); RV: risky driving (rule violation) ; DD: drunken driving ; CU: cell phone usage; NE: negligence of bike examination; AR: attitude to rule obedience; AS: attitude to speeding; AH: attitude to helmet usage; AL: altruism; SS: sensation seeking; NM: normlessness; FI: family involvement; CS: commitment to safety.

Results revealed that there are significant relations between the study variables (Table 3.5) viz., attitude to (rule obedience AR, speeding AS, use helmet AH) and altruism AL, sensation seeking SS, normlessness NM; and family involvement FI and commitment to safety CS with all risky driving variables.

3.5 SUMMARY AND CONCLUSIONS

This study identified different types of risky driving behaviour and its influencing variables from the literature review. Consequently, this study selected six types of risky driving behaviour and eight types of influencing variables, in addition to demographical variables (age, gender and educational level of the driver). Thereafter a questionnaire was designed to measure these six types of risky driving and its influencing variables. Then data was collected using a questionnaire survey among the powered two wheeler drivers from all the 14 districts of Kerala. Accordingly, all study variables were computed and the reliability of the instrument was tested using Cronbach's alpha (α), resulting in finalising the number of items of each variable. Thus, data was analyzed to find the descriptive statistics and correlation to explore the relationship of risky driving and its influencing variables. Results of correlation analysis showed that there exist significant association between the demography and study variables, and a strong and significant association between the risky driving variables and its influencing variables. The overall work of this thesis is given in the flowchart (Fig 3.3).

These facts provide a scope to test the effect of demography (gender, age and education) on risky driving variables and its influencing variables, the design of which is described and discussed in Chapter four. In addition, the influence of the personality traits (altruism, sensation seeking and normlessness) and safety attitude (attitude towards traffic flow vs rule obedience, attitude to speeding and attitude to use helmet) and family climate for road safety (family involvement and commitment to safety) on different types of risky driving variables are discussed in Chapter five.

```
┌─────────────────────────────────────┐
│ Literature Review                   │
│   • Identification of research gap  │
│     and study variables             │
└─────────────────────────────────────┘
                 ↓
┌─────────────────────────────────────┐
│      Design of survey instrument    │
└─────────────────────────────────────┘
                 ↓
┌─────────────────────────────────────┐
│ Pre-Testing of the instrument       │
│ (context validity)                  │
└─────────────────────────────────────┘
                 ↓
┌─────────────────────────────────────┐
│ Modification, refinement and        │
│ finalization of the instrument      │
└─────────────────────────────────────┘
                 ↓
┌─────────────────────────────────────┐
│ Data Collection (through field      │
│ survey)                             │
└─────────────────────────────────────┘
                 ↓
┌─────────────────────────────────────┐
│        Reliability Analysis         │ ←──────────┐
└─────────────────────────────────────┘            │
                 ↓                                   │
          ◇ Are items in the scale      No    ┌──────────────────┐
          ◇ reliable?           ──────────────→│ Remove item that │
                 │ Yes                         │ will improve     │
                 ↓                             │ reliability      │
┌─────────────────────────────────────┐       └──────────────────┘
│        Proposed Instrument          │
└─────────────────────────────────────┘      ┌──────────────────┐
                 ↓                            │ Influence of     │
┌─────────────────────────────────────┐      │ Demography on    │
│             Analysis                │ ←──── │ RD & Attitude    │
└─────────────────────────────────────┘      ├──────────────────┤
                 ↓                            │ Predicators of RD│
┌─────────────────────────────────────┐      ├──────────────────┤
│        Results and Discussion       │      │ Mediation        │
└─────────────────────────────────────┘      │ Analysis         │
                 ↓                            └──────────────────┘
┌─────────────────────────────────────┐
│       Summary and conclusions       │
└─────────────────────────────────────┘
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Fig 3.1 Flow Chart of Overall Work

CHAPTER 4

INFLUENCE OF DEMOGRAPHY ON RISKY DRIVING AND ATTITUDE VARIABLES

4.1 INTRODUCTION

This part of the study examined whether demographic variables have significant influence on risky driving behaviour, safety attitudes and family climate for road safety of powered two wheeler drivers in Kerala. The content of this chapter is divided into two sections. In the first section, the statistical significance of demography (gender, age and education) of the drivers with respect to six types of risky driving behaviour (risk due to self assertiveness RA, risky driving (speeding) RS and risk due to rule violation RV and drunken driving DD, cell phone usage CU and negligence of bike examination NE) were examined. This is followed by a discussion on the relationship of demography with these types of risky driving behaviour.

In the second section, the statistical significance of the demography (gender, age and education) of the drivers with respect to three safety attitudes (attitude to rule obedience AR, attitude to speeding AS, and attitude to use helmet AH) and two family climate for road safety (family involvement FI and commitment to safety CS) of PTW drivers were examined. This is followed by a discussion on the relationship of demography with these attitudinal variables and family climate for road safety variables. At the end of this chapter practical implications and a brief summary are presented.

4.2 RELATIONSHIP OF DEMOGRAPHY WITH RISKY DRIVING VARIABLES

Based on the above discussion, this study examines the influence of age, gender and education of the PTW drivers on six types of risky driving behaviour viz., risky driving due to (1) self assertiveness RA (2) speeding RS (3) rule violation RV and (4) drunken driving DD (5) cell phone usage CU and (6) negligence of bike examination NE.

4.2.1 Hypotheses

The following sets of hypotheses were formulated.

H 4.1: There is significant difference between male drivers and female drivers with respect to each of the six risky driving behaviour.

H 4.2: There is significant difference between drivers grouped based on age with respect to each of the six risky driving behaviour.

H 4.3: There is significant difference between drivers grouped based on educational level with respect to each of the six risky driving behaviour.

The three demographic variables and six types of risky driving behaviour make a total of 18 hypotheses.

4.2.2 Data Analysis

An independent sample t-test is conducted to examine whether there is a significant difference between male and female drivers in relation to six types of risky driving behaviour of PTW drivers and results are displayed. A series of One way ANOVA are conducted to examine whether there is significant difference between drivers grouped on the basis of age and education level on one side and six sets of risky driving

variables on the other side, followed by the post hoc test (when variances are unequal between groups, then Games-Howell is a suitable test). All analyses were conducted using the Statistical Package for the Social Sciences (SPSS -20).

4.2.3 Results and Discussion

4.2.3.1 Effect of gender

To explore the level of risky driving behaviour due to (self assertiveness RA, speeding RS and rule violation RV) and drunken driving DD, cell phone usage CU and negligence of bike examination NE, the mean of the summated scores of each of these variables on the basis of gender was computed. An independent sample t-test was conducted to examine whether there is significant difference between male and female drivers in relation to six types of risky driving (RA, RS, RV, DD, CU and NE) and the same is presented in Table 4.1. Results revealed statistically significant difference between male and female drivers with respect to risk due to self assertiveness RA, risky driving (speeding) RS and risk due to rule violation RV and drunken driving DD and cell phone usage CU. On the basis of gender, no significant difference was found with respect to negligence of bike examination NE.

The results suggest that male drivers expose themselves to higher risks as they engage in higher level of RA, RS and RV than female drivers. The male drivers were found more inclined to involve in risky driving RA (e.g., drive recklessly and/or break traffic rules due to peer pressure) and RS (e.g., exceed the speed limit) than females by 10.7% and 18.2% respectively. This suggests that males have significantly higher risky driving tendencies due to self assertiveness and speeding than females. They do not consider this kind of risky driving (self assertiveness and speeding) to be morally

wrong as females do, and do not regret from engaging in it. Males also perceive that their peers would not disapprove their engaging in risky driving RA and RS. This result is consistent to Chang and Yeh (2007) and Md Nor and Abdullah (2014), who found that male drivers were more inclined to drive above the speed limit as compared to the female drivers.

Table 4.1 Comparison of mean of six risky driving variables:
Results of t - test based on Gender

Factor	Mean (SD)		Mean Difference	t
	Male	Female		
Risk due to self assertiveness RA	2.28(1.01)	2.06(.93)	0.22	3.18**
Risk due to speeding RS	2.73(.99)	2.31(.87)	0.42	6.3**
Risk due to rule violation RV	2.54(1.02)	2.30(.89)	0.24	3.56**
Drunken driving DD	2.35(1.29)	1.82(.67)	0.53	8.60**
Cell phone usage CU	2.53(.93)	2.29(1.03)	0.24	3.26**
Negligence bike examination NE	2.78(1.03)	2.71(.96)	0.07	0.90

** $p < .01$

In the case of risky driving RV (e.g., disregard red light on an empty road and/or drive the wrong way, in one way road), male drivers were found more inclined to involve in that risky driving by 10.3% than females, consistent to the findings of Parker et al. (1992) who found that males expressed the outcomes of the violations less negatively than females did and reported that they had less control over committing the violations than females did and had significantly weaker intentions not to commit the violations. Similar results were found in Lonczak, Neighbors and Donovan (2007) and Parker et al. (1995). The tendency of female drivers to exhibit greater aversion towards risky driving can be attributed to their law-abiding nature. In the case of drunken driving, the male drivers were found to possess 30% higher level of drunken driving than female drivers. These results suggest that male drivers expose themselves to higher risks as they engaged in more drunken driving consistent to the conclusions

of earlier studies (Brookhuis et al., 2011; Font-Ribera et al., 2013). Cell phone usage while driving among male drivers is found higher compared to females in line with Pöysti et al. (2005) who found that young, male drivers used their phones while driving more often than the older drivers and females, possibly because young, male drivers assume themselves more skilful than other drivers. Thus, out of the six hypotheses in the first set H4.1, the first five hypotheses are fully supported and the last hypothesis is rejected.

4.2.3.2 Effect of age

The summated mean scores of six types of risky driving due to self assertiveness RA, speeding RS and rule violation RV and drunken driving DD, cell phone usage CU and negligence of bike examination NE, on the basis of age were computed and the same is presented in Table 4.2. One way ANOVA was run to examine whether there is a significant difference between drivers grouped on the basis of age on one side and six sets of risky driving behaviour on the other side (Table 4.2).

Table 4.2 Comparison of mean of the six risky driving variables:
Results of ANOVA based on Age

Factor	Age in years					ANOVA
	18-22	23-29	30-39	40-49	50-63	F value
RA	2.37	2.30	2.23	2.07	1.93	5.80**
RS	2.77	2.73	2.66	2.44	2.42	5.47**
RV	2.57	2.56	2.52	2.39	2.06	3.42**
DD	2.19	2.31	2.35	2.27	2.06	1.44
CU	2.58	2.51	2.51	2.39	2.21	3.67**
NE	2.76	2.77	2.86	2.73	2.66	0.46

** $p < .01$; RA: risky driving (self assertiveness); RS: risky driving (speeding); RV: risky driving (rule violation); DD: drunken driving; CU: cell phone usage; NE: negligence of bike examination.

The results revealed significant difference among the drivers grouped on the basis of age with respect to all variables except DD and NE. The scores of risky driving among the age group 18-22 were found higher compared to other age bands, which

suggest that young drivers of age group 18-22 expose themselves to higher risks of RA, RS, RV and CU compared to drivers of other age bands. Post hoc test is used whenever a significant difference between three or more sample means has been revealed by an analysis of variance (ANOVA). In this study it is used to investigate which pairs of age groups differ significantly in each of the four risky driving variables where significant difference based on age groups are indicated.

The Post hoc (Games-Howell) test based on age for risk scales RA, RS, RV and cell phone usage CU are displayed in Table 4.3. The results revealed that drivers of age below 29 have significant difference compared to age above 50 years on RA. Specifically, the drivers of age bands 18-22 and 23-29 are more likely to be involved in RA by 1.23 and 1.19 times respectively than the drivers of age band 50- 63. It is also found that the drivers of age band 18-22 have significant difference compared to age band 40-49 on RA and are more likely to be involved than age band 40-49. These results suggest that drivers of age above 40 years believe that it is morally wrong to break traffic rules or drive recklessly. These results are consistent to the findings of Paus (2005- cited in Constantinou et al., 2011) that the brain and particularly the prefrontal cortex regions associated with executive functions such as inhibition, reasoning and decision making, do not fully develop until the age of 25'; therefore, young drivers may not be ready to manage the risks of such a complex task as driving. Table 4.3 revealed other pairs of age groups have no significant difference on the basis of age on risky driving RA, which indicates that involvement of these age groups on risky driving RA makes no difference.

Table 4.3 Post hoc Test on RA, RS, RV and CU based on Age band

Dependent Variable	Age band (l)	Age band (j)	Mean (j)	Difference	Mean Square	ANOVA F
RA	18-22 Mean = 2.37	23 -29	2.30	0.07	5.75 0.99	5.80**
		30 -39	2.23	0.14		
		40 -49	2.07	0.31*		
		50 -63	1.93	0.44**		
	23-29 Mean = 2.30	30-39	2.23	0.07		
		40-49	2.07	0.23		
		50-63	1.93	0.37**		
	30-39 Mean = 2.23	40-49	2.07	0.16		
		50-63	1.93	0.30		
	40-49	50-63	1.93	0.14		
RS	18-22 Mean = 2.77	23-29	2.73	0.04	5.20 0.95	5.47**
		30-39	2.66	0.11		
		40-49	2.44	0.33**		
		50-63	2.42	0.35**		
	23-29 Mean = 2.73	30-39	2.66	-.07		
		40-49	2.44	0.29**		
		50-63	2.42	0.31**		
	30-39 Mean = 2.66	40-49	2.44	0.22		
		50-63	2.42	0.24		
	40-49	50-63	2.42	0.02		
RV	18-22 Mean = 2.57	23-29	2.56	0.01	3.42 1.00	3.42**
		30-39	2.52	0.05		
		40-49	2.39	0.18		
		50-63	2.22	0.35*		
	23-29 Mean =2.56	30-39	2.52	0.04		
		40-49	2.39	0.17		
		50-63	2.22	0.34*		
	30-39 Mean = 2.52	40-49	2.39	0.13		
		50-63	2.22	0.30		
	40-49	50-63	2.22	0.13		
CU	18-22 Mean = 2.58	23-29	2.52	0.06	3.26 .89	3.67**
		30-39	2.51	0.07		
		40-49	2.39	0.18		
		50-63	2.21	0.37*		
	23-29 Mean =2.52	30-39	2.51	0.01		
		40-49	2.39	0.13		
		50-63	2.21	0.31*		
	30-39 Mean = 2.51	40-49	2.39	0.12		
		50-63	2.21	0.30*		
	40-49	50-63	2.21	0.18		

*p < .05; **p < .01; RA: risk due to self assertiveness; RS: risky driving (speeding); RV: risk due to rule violation; CU: cell phone usage.

In the case of risky driving RS (exceed speed limit), results revealed that drivers of age below 29 have significant difference compared to age above 40 years. Specifically, drivers of age bands 18-22 and 23-29 are more likely to be involved, 1.15 and 1.13 times respectively, than the drivers of age band 50-63 on RS. Also, drivers of age bands 18-22 and 23-29 are more likely to be involved by 1.12 and 1.11 times respectively than the drivers of age band 40-49 on RS. These results are consistent to the findings of Tseng (2013) who found that speeding violations among younger age group (20-29) are significant and higher than the other age groups. Table 4.3 revealed other pairs of age groups which have no significant difference on the basis of age band on risky driving RS, which indicates that involvement of these age groups on risky driving RS makes no difference.

The Post hoc test based on age groups for risky driving RV (rule violation) reveals that drivers of age below 29 have significant difference compared to age above 50 years. Specifically, drivers of age bands 18-22 and 23-29 are more likely to be involved, 1.16 and 1.13 times respectively, on risky driving RV (rule violation) than the drivers of age band 50-63. This finding is consistent to the findings of Rutter and Quine (1996) and Parker et al. (1995) who found that youth hood plays a much greater role than inexperience; and accidents are associated with a particular pattern of behaviour-notably a willingness to break the law and violate the rules of safe riding.

Results of Post hoc test on cell phone usage CU revealed that age band 50-63 has significant difference compared to all age bands except 40-49 years. It can be interpreted that the two groups have similar levels of CU and it is comparatively less than that of other age groups. The drivers of age bands 18-22, 23-29 and 30-39 are found to score higher CU when compared to the drivers of age band 50-63, consistent

to the findings of Pöysti et al. (2005) who showed that age is a strong determinant of phone-related hazards such as using phone in traffic. Similar results were found by Tractinsky et al. (2013) who found that regardless of road conditions, young drivers are more likely to initiate calls than older and more experienced drivers.

This study found no significant difference between drivers based on age with drunken driving DD differing from Romano et al. (2012) who found that young drivers are more likely to be involved in drunken driving than older ones. This study also found no significant difference between drivers based on age with negligence of bike examination NE. Thus, out of the six hypotheses in the second set H4.2, four hypotheses are partially supported and the hypotheses on DD and NE are rejected.

4.2.3.3 Effect of education level

The mean of the summated scores of risky driving (RA, RS, RV, DD, CU and NE) on the basis of education level were computed and the same is presented in Table 4.4. One-Way ANOVA is run to examine whether there is significant difference in the mean scores of risky driving variables on the basis of education level of drivers, and the results are presented in Table 4.4.

Table 4.4 Comparison of mean of the six risky driving variables:
Results of ANOVA based on Education

Factor	Education Level				ANOVA
	Grade 10	Grade 12	Degree	Degree+	F value
RA	2.72	2.33	2.14	1.87	31.08**
RS	3.11	2.66	2.57	2.44	20.76**
RV	3.07	2.57	2.37	2.14	39.02**
DD	2.94	2.29	2.08	1.96	32.33**
CU	2.64	2.65	2.40	2.29	9.76**
NE	3.27	2.81	2.63	2.53	26.48**

** $p < .01$ RA: risk due to self assertiveness; RS: risky driving (speeding); RV: risk due to rule violation; DD: Drunken driving; CU: cell phone usage; NE: negligence of bike examination.

Results (Table 4.4) revealed that drivers grouped on the basis of education were found to have significant difference on all types of risky driving. It is interesting to note that the scores on all the six risky driving behavior measures decreases with increase in level of education of the drivers.

Results of the post-hoc test (Table 4.5) revealed significant difference between various levels of education of the driver with respect to six types of risky driving. In the case of risky driving RA (self assertiveness), significant differences were identified between all groups based on education. Similar results were found in the studies of Hasselberg et al. (2005) who reported that the drivers with low educational level (basic and secondary) were at greater risk of severe injuries, and showed excess risks of crashes of all kinds than drivers with a higher education. The mean score of Grade 10drivers on RA was found to increase by 46.24% than that of drivers of above degree-educated. Also mean score of Grade 12drivers on RA was found to increase by 24.60% than that of drivers of above degree.When it comes to risky driving RS (exceed the speed limits) drivers educated up to Grade 10 have significant difference compared to drivers of other educated groups.

Drivers of Grade 12educated have significant difference with drivers of above degree education. No significant difference was found for drivers of Grade 12educated, compared to drivers educated up to degree (Table 4.5). This result is consistent to the findings of Shinar (1993) who found that speeding behaviour is associated with lower income and primary education of drivers. While, Tseng (2013) contradicted this result, that high-education drivers have the highest percentage of having at least one speeding ticket.

Table 4.5 Post hoc Test of risky driving variables based on Education Level

Factor	Education Level (l)	Education Level (j)	Mean of (j)	Difference (l-j)	Mean Square	ANOVA F value
RA	10 Grade Mean = 2.72	12 Grade	2.33	0.39**	29.21 .94	31.07**
		Degree	2.14	0.58**		
		Degree +	1.86	0.86**		
	Grade 12 Mean = 2.33	Degree	2.14	0.19*		
		Degree +	1.86	0.47**		
	Degree	Degree +	1.86	0.28**		
RS	Grade 10 Mean = 3.11	12 Grade	2.66	0.45**	19.15 0.92	20.76**
		Degree	2.57	0.54**		
		Degree +	2.44	0.67**		
	12 Grade	Degree	2.57	0.09		
		Degree +	1.86	0.22*		
	Degree	Degree +	1.86	0.13		
RV	10 Grade Mean = 3.07	12 Grade	2.57	0.50**	36.16 .93	39,02**
		Degree	2.36	0.71**		
		Degree +	2.14	0.93**		
	Grade 12 Mean = 2.57	Degree	2.36	0.21**		
		Degree +	2.14	0.43**		
	Degree	Degree +	2.14	0.22**		
DD	10 Grade Mean = 2.94	12 Grade	2.29	0.65**	2.92 .86	3.39**
		Degree	2.08	0.86**		
		Degree +	1.96	0.98**		
	Grade 12 Mean = 2.29	Degree	2.08	0.21		
		Degree +	1.96	0.33**		
	Degree	Degree +	1.96	0.12		
CU	10 Grade Mean = 2.64	12 Grade	2.65	.01	8.58 .88	9.76**
		Degree	2.40	.24*		
		Degree +	2.29	.35**		
	Grade 12 Mean = 2.65	Degree	2.40	.25**		
		Degree +	2.29	.36**		
	Degree	Degree +	2.29	.11		
NE	10 Grade Mean = 3.27	12 Grade	2.82	.45**	26.00 .98	26.48**
		Degree	2.63	.64**		
		Degree +	2.53	.74**		
	Grade 12 Mean = 2.82	Degree	2.63	.19*		
		Degree +	2.53	.29**		
	Degree	Degree +	2.53	.10		

**p < .01; *p < .05 RA- risk (self assertiveness); RS- risk (speeding); RV- risk (ruleviolation); DD- drunken driving; CU- cell phone usage; NE- negligence of bike examination

No significant difference on risky driving RS is observed between drivers educated up to degree and above degree. The mean score of Grade 10drivers on RS was found to increase by 27.46% than that of drivers educated above degree. Also mean score of Grade 12drivers on RS was found to increase by 9.01% than that of drivers educated above degree.

In the case of risky driving RV (rule violation), significant differences were identified between all groups based on education. The mean score of Grade 10and Grade 12 drivers on RV were found to increase by 43.45% and 20.09% respectively than that of drivers educated above degree. Similar results were found in Hassen et al. (2011) who observed that drivers with secondary or high school education had higher risky driving behaviour than drivers with university or college education. This can be attributed to the fact that the PTW drivers educated up to degree and above degree are inclined towards less rule violation compared to other drivers based on education level.

When it comes to drunken driving DD, drivers educated up to Grade 10 have significant difference compared to drivers of other educated groups. Drivers of Grade 12 educated have significant difference with drivers of above degree education level. No significant difference was found on drunken driving DD for driver pairs of Grade 12 educated and educated up to degree as well as driver pairs of educated up to degree and above degree. The mean scores of drunken driving DD of Grade 10 was found to increase by 50% than that of drivers of above degree, consistent to the findings of Romano et al. (2012) who found that drivers with lower than 12 years of education level were 1.62 times more likely to be involved in alcohol-related crashes than drivers with 12 to 14 years of education level. The results of the present study can be

attributed to the fact that the PTW drivers of Kerala with degree and above degree education have a better understanding and apprehension of the impairing effects of driving after consuming alcohol. This result is contradicted by Akaateba, Amoh-Gyimah, and Amponsah (2015) who found no significant differences between various levels of formal educational attainments and drunken driving in Ghana, for the reason that driving under the influence of alcohol is more likely a habitual activity that is developed regardless of one's level of formal education in that part of the world.

Results of cell phone usage CU showed that drivers educated up to Grade 10 have significant difference compared to drivers educated up to degree and above degree. Specifically, Grade 10 drivers are more inclined to use cell phone compared to drivers educated up to degree and above degree by 10% and 15.3% respectively. This may possibly be due to the risk perceptions and road safety awareness of drivers educated up to degree and above degree in using cell phone while driving. It is also noted that there is no significant difference of driver pairs educated up to Grade 10 and Grade 12 in cell phone usage while driving. Result also showed that drivers educated up to Grade 12 are more inclined to use cell phone compared to drivers educated up to degree and above degree by 10% and 15.3% respectively. No significant difference was found on CU between drivers educated up to degree and above degree.

Regarding negligence of bike examination, drivers educated up to Grade 10 have significant difference compared to drivers of other educated groups as well as Grade 12 have significant difference compared to drivers of degree and above degree. Also, drivers of degree educated have no significant difference compared to drivers of above degree on NE. These results indicate that less educated drivers are careless in bike examination before a trip, probably may be due to their socio-economic positions.

In general, higher education among the drivers decreases the tendency to involve in the risky driving of RA, RS and RV and pulls down the habits of drunken driving and cell phone usage and decimates negligence of bike examination. Thus, in the third set of hypotheses, two are fully supported and the remaining four hypotheses are partially supported. The results of this study reflect risky driving behaviour on the part of various groups of PTW drivers in Kerala. The key target groups of components of risky driving would include those with young age, male and educated up to 10 Grade, whereas all components of risky driving are found to be quite low among females and older drivers, and those educated up to degree and above degree.

4.3 RELATIONSHIP OF DEMOGRAPHY ON SAFETY ATTITUDES AND FAMILY CLIMATE FOR ROAD SAFETY

This part of the study examines the influence of gender, age and education level of PTW drivers on three attitude scales (attitude to rule obedience AR, attitude to speeding AS and attitude to use helmet AH) and two family climate for road safety scales (family involvement FI and commitment to safety CS).

4.3.1 Hypotheses

The following sets of hypotheses were advanced.

H4.4: There is significant difference between male drivers and female drivers with respect to each of the attitude scales and family climate for road safety scales of PTW drivers.

H4.5: There is significant difference between drivers grouped based on age with respect to each of the attitude scales and family climate for road safety scales of PTW drivers.

H4.6: There is significant difference between drivers grouped based on educational level with respect to each of the attitude scales and family climate for road safety scales of PTW drivers.

The three demographic variables and five variables of attitude scales and family climate for road safety scales make a total of 15 hypotheses.

4.3.2 Data Analysis

An independent sample t-test is conducted to examine whether there is a significant difference between male and female drivers in relation to five variables of attitude scales and family climate for road safety scales (attitude to rule obedience AR, attitude to speeding AS, attitude to use helmet AH and family involvement FI and commitment to safety CS) of PTW drivers. A series of One way ANOVA are conducted to examine whether there is a significant difference with respect to three variables of attitude scales and two variables of family climate for road safety scales on the basis of age and education of drivers. To investigate any significant differences in the attitude scales and family climate for road safety scales among drivers of different age groups and education levels, Games Howell Post hoc analysis were used.

4.3.3 Results and Discussion

4.3.3.1 Effect of gender

An independent sample t-test was conducted to examine whether there is significant difference between male and female drivers in relation to three variables of attitudes and two variables of family climate for road safety (attitude to rule obedience AR, attitude to speeding AS attitude to use helmet AH and family involvement FI and commitment to safety CS) and results are displayed in Table 4.6. The t-test revealed statistically significant difference between male and female drivers with respect to

attitude variables (AR, AS and AH) and family involvement FI. No significant difference was found with commitment to safety CS.

Table 4.6 Comparison of mean of the attitudinal and family climate
for road safety variables: Results of t - test based on Gender

Factor	Mean (SD)		Mean Difference	t value
	Male	Female		
Attitude to traffic flow vs rule obedience AR	2.77(.97)	3.02(.87)	-.25	-3.50**
Attitude to speeding AS	2.94(1.02)	3.17(.98)	-.24	-3.19**
Attitude to use helmet AH	3.62(1.07)	3.83(.95)	-.21	-2.80**
Family involvement FI	3.55(1.01)	3.78(.96)	-.24	-3.14**
Commitment to safety CS	3.43(1.08)	3.50(1.03)	-.07	-.87

** $p < .01$

The female drivers were found to possess higher level of safety attitudes AR and AS by 9% and 8.1% respectively than male drivers, consistent to Laapotti, Keskinen, and Rajalin(2003) who found that female drivers showed more positive attitude toward traffic rules and safety than males. This result is contradicted by Chen (2009) who found that male drivers possess higher level of safety attitudes AS than females by 6.6% and no significant difference was found on AR on the basis of gender. The female drivers were also found to possess higher level of attitude to use helmet AH by5.8% than male drivers, in tune with the findings of Kulanthayan et al. (2001). This tendency of female drivers to have greater aversion towards risk taking attitude to driving can be attributed to their law-abiding nature. The female drivers were also found to possess higher level of family involvement by 6.8% than males, possibly because female drivers are more attached to their parents compared to male drivers consistent to the findings of Taubman-Ben-Ari and Katz- Ben-Ami (2013) who observed that young women report higher positive aspects of the family climate than young, male. Thus, out of the five (first set) hypotheses in H4.4, four hypotheses were fully supported and the hypothesis on commitment to safety CS was rejected.

4.3.3.2 *Effect of age*

The summated scores of attitude to (rule obedience AR, speeding AS and use helmet AH) and family climate for road safety (family involvement FI and commitment to safety CS) on the basis of age were computed and the same is presented in Table 4.7.One way ANOVA was run to examine whether there is significant difference with respect to three attitude scales and two family climate for road safety scales on the basis of drivers' age (Table 4.7).

Table 4.7 Comparison of mean of attitudinal and family climate for road safety variables: Results of ANOVA based on Age

Factor	Age in years					ANOVA
Attitude (traffic flow vs obedience) AR	18-22	23-29	30-39	40-49	50-63	F value
	2.69	2.76	2.86	2.91	3.13	5.13**
Attitude (speeding) AS	2.86	2.93	2.95	3.18	3.23	4.85**
Attitude (use helmet) AH	3.65	3.60	3.66	3.69	3.70	0.31
Family involvement FI	3.69	3.54	3.49	3.55	3.65	1.95
Commitment to safety CS	3.43	3.39	3.49	3.49	3.43	0.81

** $p < .01$

The result (Table 4.7) revealed significant difference among thedrivers grouped on the basis of age with respect to attitude to rule obedience AR and attitude to speeding AS. No significant difference among the drivers grouped on the basis of age with attitude to use helmet AH and family climate for road safety (family involvement FI and commitment to safety CS) were observed in the test.

To investigate which age group differ significantly with respect to AR (rule obedience) and AS (speeding) post hoc analysis was used. The results are presented in Table 4.8. The result revealed that, drivers of age below 29 have significant difference on attitude to rule obedience AR compared to age above 49 years. No significant difference on AR was found with other pairs of age bands. This finding is consistent to Laapotti,

Keskinen, and Rajalin (2003) who found that young drivers showed more negative attitudes toward traffic rules and safe driving. Drivers of age band 50-63 possess higher attitude to rule obedience AR compared to age bands 18-22 and 23-29 by 16.36% and 13.40% respectively.

Table 4.8 Post hoc test on AR and AS based on Age

Factor	Age band l	Age band j	Mean of j	Difference e l-j	Mean Square	ANOVA F value
AR	18-22 Mean = 2.69	23-29	2.76	-.07	4.70 .92	5.13***
		30-39	2.86	-.17		
		40-49	2.91	-.22		
		50-63	3.13	-.44**		
	23-29 Mean = 2.76	30-39		-.10		
		40-49		-.15		
		50-63		-.37*		
	30-39	40-49		-.05		
		50-63		-.26		
	40-49	50-63		-.21		
AS	18-22 Mean = 2.86	23-29	2.93	-.07	4.95 1.02	4.85**
		30-39	2.95	-.09		
		40-49	3.18	-.32**		
		50-63	3.23	-.37*		
	23-29 Mean = 2.93	30-39		-.01		
		40-49		-.25		
		50-63		-.29		
	30-39 M = 2.95	40-49		-.24		
		50-63		-.28		
	40-49	50-63		-.04		

*** $p < .001$; ** $p < .01$

Post hoc test on attitude to speeding AS based on age revealed that age band 18-22 has significant difference compared to age above 40 years. No significant difference was found with other pairs of age bands. Drivers of age band 50-63 possess higher attitude to speeding AS compared to age band 18-22 by 12.94%. These results are in line with the findings of Tseng (2013) who found that 23.7% of the younger age group (20-29) among Taiwan's male drivers reported at least one speeding violation.

No significant difference of the drivers grouped on the basis of age was found on attitude to use helmet AH. This result is contradicted by Kulanthayan et al. (2001) who found that as age increases the compliance level of helmet usage also increases. Thus, out of the five (second set) hypotheses in H4.5, first two hypotheses on AR and AS are partially supported and the hypotheses on other factors AH, FI and CS with respect to age differences are rejected.

4.3.3.3 Effect of education

The mean of the summated scores of attitude to (rule obedience AR, speeding AS, use helmet AH) and family climate for road safety (family involvement FI and commitment to safety CS) on the basis of education level were computed and the same is presented in Table 4.9. Results reveal that, the mean scores of all the measures are found to improve with education. A One-way ANOVA between groups based on education level was run on five data groups in order to find out if there were any significant differences in AR, AS, AH and FI and CS (Table 4.9). The result revealed significant difference of the drivers grouped on the basis of education with respect to all attitudinal variables and family climate for road safety variables.

Table 4.9 Comparison of mean of attitudinal and family climate for road safety variables: Results of ANOVA based on Education

Factors	Education Level				ANOVA
	10 Grade	12 Grade	Degree	Above Degree	F value
Attitude to rule obedience AR	2.29	2.75	2.94	3.14	35.79**
Attitude to speeding AS	2.53	2.95	3.07	3.24	21.29**
Attitude to use helmet AH	2.97	3.57	3.86	3.97	48.42**
Family involvement FI	2.99	3.49	3.77	3.87	40.82**
Commitment to safety CS	2.83	3.38	3.61	3.75	36.50**

** $p < .01$

The Post hoc test based on education was run on five attitudinal and family climate data groups in order to find out which groups differ significantly with respect to AR, AS, AH and FI and CS and the results are presented in Table 4.10. Post hoc test reveals that, there is significant difference in AR with respect to all pairs of educational groups. The mean score of drivers educated above degree on AR was found to be higher by 37.12% compared to Grade 10 drivers. Regarding AS, the result reveals that Grade 10 drivers have significant difference with other educational groups. The mean score of drivers educated above degree on AS was found to be higher by 28.06% than Grade 10 drivers. Degree level drivers have no significant difference with grade 12 and above degree educated drivers.

Drivers educated up to Grade 12 have significant difference with other educational groups on AH. The mean score of drivers educated above degree on AH was found to be higher by 33.67% compared to that of drivers educated up to Grade 10. This can be attributed to the fact that the PTW drivers educated up to degree and above degree are inclined towards higher level of safety attitudes and attitude to use helmet. This result is in line with Kulanthayan et al. (2000) who found that safety helmet usage increases with increasing level of formal education. There is no significant difference between degree and above degree educated drivers with respect to AH. Drivers educated up to Grade 12 have significant difference with other educational groups on FI. The mean score of drivers educated above degree on FI was found to be higher by 29.43% than that of drivers educated up to Grade 10. This may be due to the fact that highly educated drivers of families where a road safety climate exists express an empathetic view on other road users, reducing unsafe driving. Although this study found significant differences between various levels of educated drivers on family involvement there is no prior published data on this.

Table 4.10 Post hoc test on attitudinal variables based on Education Level

Factor	Education Level (l)	Education Level (j)	Mean of (j)	Difference (l-j)	Mean Square	ANOVA F value
AR	10 Grade Mean = 2.29	12 Grade	2.75	-.46**	30.72 .86	35.79**
		Degree	2.94	-.65**		
		Degree +	3.14	-.85**		
	12 Grade	Degree		-.19**		
		Degree +		-.39*		
	Degree	Degree +		-.20*		
AS	10 Grade Mean = 2.53	12 Grade	2.95	-.42**	20.99 .99	21.29**
		Degree	3.07	-.54**		
		Degree +	3.24	-.71**		
	12 Grade	Degree		-.12		
		Degree +		-.29**		
	Degree	Degree +		-.17		
AH	10 Grade Mean = 2.92	12 Grade	3.56	-.64**	54.17 1.14	47.67**
		Degree	3.86	-.89**		
		Degree +	3.97	-1.0**		
	12 Grade	Degree		-.29**		
		Degree +		-.40**		
	Degree	Degree +		-.11		
FI	10 Grade Mean = 2.99	12 Grade	3.49	-.50**	37.74 .92	40.82**
		Degree	3.77	-.78**		
		Degree +	3.87	-.88**		
	12 Grade	Degree		-.28**		
		Degree +		-.38**		
	Degree	Degree +		-.10		
CS	10 Grade Mean = 2.83	12 Grade	3.38	-.55**	38.65 1.06	36.50**
		Degree	3.61	-.78**		
		Degree +	3.75	-.92**		
	12 Grade	Degree		-.23**		
		Degree +		-.37**		
	Degree	Degree +		-.14		

**p < .01, AR- attitude to rule obedience; AS- attitude to speeding; AH- attitude touse helmet; FI- family involvement; CS- commitment to safety.

There is no significant difference between degree and above degree educated drivers with respect to FI. Commitment to safety has significant difference among all pairs of educational groups, except between degree and above degree. The mean score of

drivers educated above degree on commitment to safety was found to be higher by 32.50% than that of drivers educated up to Grade 10. Although this study found significant differences between various levels of educated drivers on commitment to safety, there is no prior published data on this. Thus, all hypotheses in third set H4.6 are partially supported.

4.4 PRACTICAL IMPLICATIONS

Young, male and less educated drivers were found to score high in various risky driving behaviour. They also possess low safety attitudes compared to old and female drivers. This result could be used to conduct appraisal and counselling programme about the various types of risky driving acts resulting from self assertiveness, speeding, rule violation and drunken driving and cell phone usage while driving targeting the male and young riders educated up to Grade 12.These results could also be used to promote the use of helmets and to illuminate awareness among road safety authorities of Kerala, to develop the spirit of healthy family atmosphere among the riders. Attitude to use helmet can be promoted using educational campaigns, free helmet along with purchase of new PTW. In Kerala, stringent enforcement of legislation includes: riders of cell phone use would be reported to the licensing authority, which will disqualify the license for one year with a fine; unhelmeted riders are also fined.

4.5 SUMMARY

In the first section of this chapter, the statistical significance of the demography (gender, age and education) of the drivers with respect to six types of self reported risky driving due to (self assertiveness, speeding and rule violation) and drunken driving, cell phone usage and negligence of bike examination were examined. Three hypotheses have been developed to test the relationship between age, gender and education and six

types of risky driving behaviour. Significant difference on six types of risky driving, except negligence of bike examination was found on the basis of gender. The male drivers were found to expose themselves to higher risks as they engaged in higher level of RA, RS, RV and DD and CU than female drivers. On the basis of age, significant difference with respect to all risky driving behaviour, except drink drive and negligence of bike examination was found. The Post hoc test based on age revealed that risky driving RA, RS, RV and CU decrease with age. On the basis of education, significant statistical difference was found with respect to all six risky driving variables. Scores of six risky driving of drivers educated up to Grade 10were found higher than that of the drivers educated up to degree and above degree which indicate that all risky driving variables of this study are prevalent among the drivers educated up to Grade 10.

In the second section of this chapter the statistical significance of the demographic variables of the drivers with respect to attitude to (obey rules, speeding and use helmet), family involvement and commitment to safety are examined. Significant differences on all sets of attitude and family climate for road safety variables on the basis of gender were found, except commitment to safety. The female drivers were found to possess higher level of AR, AS, AH and FI than male drivers showing the tendency of female drivers to observe higher level of safety attitudes. On the basis of age, significant difference with respect to AR and AS was found. Drivers of age band 50-63 possess higher AR compared to age below 29 years. The older age group 50-63 has significant difference compared to age band 18-22 on AS. On the basis of education of drivers, significant differences with respect to all attitude scales were found. An interesting observation is that well educated (degree and above degree

educated drivers have similar scores on AS, AH, FI and CS. They differ only in their level of traffic rule obedience with above degree educated drivers performing better. The findings of this part of the study could be used to enhance the safety attitudes and family involvement among young, male and less educated PTW drivers to achieve safe behaviour on the road.

4.6 CONCLUSIONS

The statistical significance of the demographic variables (gender, age and educational level) of the drivers with respect to six types of risky driving behaviour and five factors of attitudinal and family climate for road safety were examined. The young, male and less educated drivers were found to take higher risks. The female drivers were found to possess higher level of safety attitudes AR, AS, AH and FI than male drivers. The older age group 50-63 possess higher safety attitudes AR and AS. Educated (degree and above) drivers expressed high levels of safety and family involvement. The young, male and less educated drivers were found to have unsafe attitudes. These findings reveal that demography has influence on six types of risky driving behaviour as well as five factors of attitudinal and family climate for road safety, leaving a scope for the investigation of the predicators of risky driving.

CHAPTER 5

RISKY DRIVING BEHAVIOUR AND THEIR PREDICTORS

5.1 INTRODUCTION

The literature review highlights the possibility of different factors predicting different risky driving behaviour. A range of risky driving behaviour contributes to the high incidence of trauma on our roads, and it may be debated whether all risky behaviour are sufficiently similar to be explained by similar factors. Motivation to engage in different risky behaviour may vary considerably. For example, the factors that contribute to a person's decision to speed may not be the same factors that contribute to their decision to drunken driving (Fernandes, Job and Hatfield, 2007). From various risky driving behaviour explained in literature review, the current study selected six types of risky driving behaviour that are relevant to the driving culture of the PTW drivers that lead to road crashes, viz., risk due to self assertiveness RA, risky driving due to speeding RS, risky driving due to rule violation RV, drunken driving DD, cell phone usage while driving CU, and negligence of bike examination NE (Ulleberg and Rundmo, 2003; Chen, 2009; Kasantikul et al., 2005; Pöysti et al., 2005; Chang and Yeh, 2007).

Independent studies have been conducted in different parts of the world focussing on the effect of driver's (1) age, gender, and education (Keall and Newstead, 2012; Chang and Yeh, 2007; Romano et al., 2012) (2) personality traits (Chen, 2009; Ulleberg and Rundmo, 2003) (3) safety attitudes (Fernandes et al., 2007, Chen, 2009; Ulleberg and Rundmo, 2003) and (4) family climate for road safety viz., family involvement and commitment to safety (Taubman-Ben-Ari and Katz-Ben-Ami,

2013), on risky driving behaviour. This study examines the combined effect of demography (age, gender and education), personality traits (altruism AL, sensation seeking SS and normlessness NM), attitudinal factors attitude to (traffic flow vs rule obedience, speeding and use helmet) and family climate for road safety (family involvement and commitment to safety) of PTW drivers on six risky driving behaviour and investigated whether different factors predict different risky driving behaviour.

5.2 DETERMINATION OF PREDICTORS OF RISKY DRIVING BEHAVIOUR

The purpose of exploring the predictors of risky driving is to curb risky driving. It may be more feasible for road safety interventions to target predictors that are amenable to change. The literature showed that driver's personality traits (Arnett, Offers and Fine, 1997), safety attitudes (Mann and Lansdown, 2009) and family climate for road safety can be changed. A change in personality trait such as sensation seeking SS (Arnett et al., 1997) or safety attitude (Muzikante and Reņģe, 2011) may be more successful in producing behaviour change. However, in order to understand whether personality traits, attitudes and family climate for road safety significantly influence risky driving, the effects of demography (age, gender, and education level) must be taken into account (Fernandes, Job, and Hatfield, 2007). Consequently, demographic factors should be controlled prior to examining the effect of personality traits, attitudes and family climate for road safety of drivers on risky driving behaviour.

Researchers have often investigated theoretical assumptions, examining the influence of several predictor variables in a sequential way, such that the relative importance of

a predictor may be judged on the basis of how much it adds to the prediction of a criterion, over and above that has been accounted by other important predictors. In order to determine the important predictors, hierarchical regression is a suitable tool, which involves theoretically based decisions on how predictors are to be entered into the analysis (Petrocelli, 2003). Therefore, the current study employs hierarchical regression models to explore the predictors of each of the six risky driving behaviour variables (each containing a range of possible factors).

5.2.1 Data Analysis

Hierarchical regression is used to check predictors. In hierarchical regression analysis, fixed attributes such as demography (age, gender and education) are entered first. In other words, age, gender and education level are fixed attributes of an individual which were included as covariates, and were forced to enter first in the regression analyses. Personality traits (altruism AL, sensation seeking SS and normlessness NM) are defined as characteristics of an individual and it remain almost unchanged. These traits were included as covariates, and were considered after the effects of demographics were incorporated and so entered in step 2 of the regression. Safety attitudes are amenable to change by safety counselling and campaigns. In order to understand whether safety attitudes significantly influence risky driving, the effects of demography and personality traits must be taken into account. Accordingly, attitude to (rule obedience AR, speeding AS and use helmet AH) were considered after the effects of demography and personality traits were incorporated and so entered in step 3 of the regression model (Fernandes, Job, and Hatfield, 2007). In order to test whether family climate for road safety significantly influences risky driving, the effects of demography, personality traits and safety attitudes must be taken into road safety (family involvement FI and commitment to safety CS) were considered after

the effects of demography and personality traits and safety attitudes were account. Consequently, family climate for incorporated and so entered in step 4, of the regression model. That is, four regression models were considered for each of the risky driving behaviour.

A series of t – tests and One way ANOVA were conducted in the fourth chapter to examine whether there is significant difference between drivers grouped on the basis of gender, age and education on one side and six sets of risky driving variables on the other side and the results revealed that there are significant differences in the six sets of risky driving variables with respect to gender, age and education. Hence in this chapter the whole model was divided on the basis of demographic variables i.e., on the basis of gender (males and females), age (younger age band-25 years and below-and older age band-above 25 years) and education (Grade 10, Grade 12, Degree and above Degree) to form eight sub models. Thus, hierarchical regression analysis was used to explore the predictors of six types of risky driving behaviour in the whole model as well as eight sub models based on gender, age and education.

5.3 DETERMINATION OF PREDICTORS OF RISKY DRIVING (SELF ASSERTIVENESS) RA

5.3.1 Hypotheses (whole model)

The purpose of this part of the study was to examine the effect of all independent variables (gender, age and education level, altruism AL, sensation seeking SS and normlessness NM, attitude to rule obedience AR, attitude to speeding AS and attitude to use helmet AH and family involvement FI and commitment to safety CS) on risky driving due to self assertiveness RA (drive recklessly to show off). In order to achieve this, the following hypotheses were advanced.

H5.1: Demography (gender, age and education level) of the driver predicts the risky driving due to self assertiveness RA.

H5.2: Personality traits (altruism AL, sensation seeking SS and normlessness NM) of the driver predict the risky driving due to self assertiveness RA.

H5.3: Safety attitudes (attitude to rule obedience AR, attitude to speeding AS and attitude to use helmet AH) of the driver predict the risky driving due to self assertiveness RA.

 H5.4: Family climate for road safety (family involvement FI and commitment to safety CS) of the driver predict the risky driving due to self assertiveness RA.

5.3.2 Results and Discussions

5.3.2.1 Regression Model for Risky Driving RA

The results of hierarchical multiple regression analysis is presented in Table 5.1. It revealed that at step one, gender, age and education contributed significantly to the regression model, $F(3, 1295) = 23.42$, $p < .001$) and accounted for 9.2% of the variation in risky driving RA. The personality traits explained an additional 44.7% of variation in risky driving RA and this change in R^2 was significant, $F(6, 1292) = 139.35$, $p < .001$. Adding attitude variables to the regression model explained an additional 3.2% of the variation in RA and this change in R^2 was significant, $F(9, 1289) = 115.53$, $p < .001$. Finally, in step 4 the addition of family climate for road safety to the regression model explained an additional 2.6% of the variation in RA and this change in R^2 was also significant, $F(11, 1287) = 133.65$, $p < .001$. Altogether the eleven independent variables accounted for 59.7% of the variance in RA.

The final step of the hierarchical regression model (Table 5.1) revealed that among the demographical variables only age significantly and negatively predicts risky driving due to self assertiveness RA. Thus hypothesis H5.1 is partially supported. Though RA was initially predicted by gender and education, it was then superseded by a set of more dominant personality or attitudinal predictors, leaving only age as a significant predictor of RA.

Table 5.1 Hierarchical Regression Analyses: Predicting Risky Driving RA (β values)

Predictors	Step 1	Step 2	Step 3	Step 4
Gender	.07**	.02	.02	.01
Age	-.16**	-.10**	-.08**	-.09**
Education	-.26**	-.05**	-.02	-.02
Altruism AL		-.31**	-.19**	-.12**
Sensation seeking SS		.20**	.15**	.14**
Normlessness NM		.32**	.22**	.22**
Attitude (rule obedience) AR			-.12**	-.09**
Attitude (speeding) AS			-.07**	-.06**
Attitude (helmet usage) AH			-.16**	-.08**
Family involvement FI				-.25**
Commitment to safety CS				.02
F	23.42**	139.35**	115.53**	133.65**
Model R²	.092	.539	.571	.597
R² Change	.092	.447	.032	.026

** p < .01

It is seen from Table 5.1 that all three personality traits (altruism AL, sensation seeking SS and normlessness NM) significantly predict risky driving due to self assertiveness RA. Thus, hypothesis H5.2 is fully supported. The personality trait altruism AL significantly predicts RA negatively, showing that altruists are less likely to involve in RA. The traits sensation seeking SS and normlessness NM significantly predicts RA positively, indicating that the riders who use SS and NM are more likely to involve in the risky driving RA. These findings are consistent to Ulleberg and Rundmo (2003) and Chen (2009) who found that high scores on altruism, sensation

seeking and normlessness was associated with risky driving (such as risk due to self assertiveness). Among the traits, influence of normlessness NM on RA is higher than the influence of altruism AL and sensation seeking SS.

Table 5.1 also reveals that all three attitudes to (rule obedience AR, speeding AS and use helmet AH) significantly predict risky driving RA. Thus, the hypothesis H5.3 is fully supported. This result is consistent to Ulleberg and Rundmo (2003) who found that attitude towards traffic safety was the only variable with a direct effect on risky driving. Donate-Lopez et al. (2010) found that wearing a helmet does not increase the risk of being involved in a motorcycle crash. A possible explanation is that wearing a helmet while riding is an attitude to safe riding and the riders who wear helmets will not only refrain from reckless driving, but also take care of the safety of other road users too.

In the case of family climate for road safety, family involvement FI predicts RA significantly (Table 5.1). Thus, hypothesis H5.4 is partially supported. This result is consistent to the findings of Taubman-Ben-Ari, Mikulincer, and Gillath (2005) who found that both mother and father's reckless or careful driving styles are reflected in their offspring's driving. Influence of family involvement on RA is highest among the influence of all other variables on risky driving RA, which points out that many riders of Kerala give importance to the norms of family climate for road safety. Commitment to safety failed to predict the risky driving due to self assertiveness RA. Thus, it can be concluded that drivers who use higher sensation seeking and normlessness are more likely to engage in risky driving RA, while older divers (age above 25 years) who use higher altruism, all three safety attitudes to (rule obedience AR, speeding AS and use helmet AH) and family involvement FI are less likely to engage in risky driving RA.

5.3.3 Comparison of the results of Regression Analyses on Various Sub Groups

To compare the results of hierarchical regression analyses on the sub models based on drivers" gender (males and females), age (younger age and older age) and education level (Grade 10, Grade 12, Degree and above Degree), the results of the fourth step of the hierarchical regression analyses of all six types of risky driving behaviour are employed.

5.3.4 Comparison of results of Regression analysis of Risk (self assertiveness) RA of Sub Groups

Table 5.2 presents the results of hierarchical regression analysis on RA among the eight sub models. In the male model drivers having higher education and possessing sensation seeking SS and normlessness NM are more likely to engage in RA consistent to Fernandes, Job and Hatfield (2007), who found that reckless driving was significantly predicted by gender. This result also supports the findings of Zuckerman (1994) who reported that sensation seeking SS is the most common purpose of risky driving for young people, particularly young, male drivers. It is also seen that male drivers who use attitude to speeding AS (reducing speed) and use helmet AH and family involvement FI are less likely to involve in RA. In the female model influence of sensation seeking SS and normlessness NM are considerably lesser than that in males. This means that females are less inclined to risky driving RA, than male drivers, due to the effect of their low scores in sensation seeking SS and normlessness NM, consistent to the findings of Arnett, Offers and Fine (1997) who found that boys reported higher sensation seeking than girls as well as the findings of Neal (1959) and Chen (2009) who found that males have higher normlessness than females.

Table 5.2 Hierarchical Regression Analyses on Sub Models: Predicting Risky Driving RA

	Gender (β values)		Age (β values)		Education (β values)			
	Male	Female	25 and below	above 25	Grade 10	Grade 12	Degree	Above Degree
N =	1089	210	644	655	216	350	525	208
R² = F =	.769 357**	.601 29.9**	.544 75.4**	.641 115**	.745 59.9**	.579 46.7**	.509 53.3**	.877 141**
Age Gender Edu	-.03 - .05*	-.07 - .01	- .01 -.02	- .01 -.06	-.02 -.01 -	-.15** .06 -	-.09** .03 -	-.03 -.02 -
AL SS NM	.01 .46** .52**	-.04 .13* .31**	-.13** .16** .21**	-.12** .11** .24**	-.04 .05 .40**	-.22** .04 .14**	-.11** .18** .26**	.18 .73** .29**
AR AS AH FI CS	-.04 -.12** -.15** -.22** .13	-.00 -.11 -.05 -.35** -.00	-.08* -.07 -.08 -.26** .04	-.12** -.06 -.09 -.23** -.01	-.09 -.08 -.07 -.31** .07	-.05 -.11 -.10 -.25** .02	-.12** -.03 -.10* -.21** .01	-.14 -.28** .06 -.67** .22

** $p < .01$; * $p < .05$; Edu: education; AL: altruism AL; SS: sensation seeking; NM: normlessness NM; AR: attitude (rule obedience); AS: attitude (Speeding); AH: attitude (helmet use); FI: family involvement; CS: commitment to safety

The results show that attitude to use helmet failed to predict RA among females because most of the female drivers use helmet compared to males. The effect of family involvement FI on RA is high among females compared to males. This can be attributed to the fact that female drivers who have high parental bonding are less likely to involve in risky driving RA, which is supported in an earlier study by Taubman-Ben-Ari and Katz- Ben-Ami (2013) who found that young women riders reported higher positive aspects of the family climate than young, male riders. Age, altruism AL, attitude to rule obedience AR and commitment to safety CS among male model and age, education, altruism AL and three attitudinal variables (AR, AS and AH) and CS among female model failed to predict RA.

Tables 5.2 also revealed that, among both the age groups, sensation seeking SS and normlessness NM significantly and positively predict risky driving RA. The influence of SS on RA is high among younger age band than in the older age band, showing that drivers of younger age band adopt RA more than the older age band. It is also found that the influence of NM on RA is slightly higher among the older age band than in the younger age band. This is possibly due to the fact that there is a tendency among older age groups to achieve their goals, ignoring the norms and interests of the society. This is similar to the findings of Nordfjarn et al. (2014) who found that both sensation seekers and those who score high on normlessness report more rule violations. The variables altruism AL, attitude to rule obedience AR and family involvement FI significantly predict the risky driving RA negatively in both age bands. Influence of altruism AL on RA is almost the same in both age bands while the influence of attitude to rule obedience AR on RA is higher among the older age band than in the younger age band. This shows that attitude to rule obedience improves with age, confirming the findings of Chang and Yeh (2007) who observed that young riders and male motorcycle riders were more likely to disobey traffic regulations. It is also seen that influence of family involvement FI on RA among younger age band is higher than in the older age band, consistent to Taubman-Ben-Ari et al. (2015) who found that the parents" driving behaviour, the family climate and the family members" attitude toward road safety significantly contributes to teens" driving behaviour. Gender, education, attitude to speeding AS, usage of helmet AH and commitment to safety CS failed to predict RS in both the age bands. Thus, it can be concluded that drivers possessing high sensation seeking and normlessness are more likely to employ RA and drivers possessing altruism, attitude to rule obedience and family involvement are less likely to adopt RA.

In the case of educational models (Table 5.2), among Grade 10 drivers, normlessness NM significantly predicts RA positively and family involvement FI significantly and negatively predicts RA. This suggests that drivers of Grade 10, scoring high on normlessness NM are more likely to engage in RA and these drivers who use high family bonding FI are less likely to engage in RA. Among Grade 12 drivers, normlessness NM significantly predicts RA positively while age, altruism AL and family involvement FI significantly predict RA negatively. This implies that Grade 12 drivers possessing high normlessness NM are more likely to employ RA, also these drivers, being old (above 25 years), possessing high altruism AL and family bonding are less likely to engage in RA. Among degree educated drivers, sensation seeking SS and normlessness NM significantly predict RA positively, while age, altruism AL, attitude to rule obedience AR, attitude to use helmet AH and family involvement FI significantly predict RA negatively. That is, degree educated drivers with high scores of sensation seeking SS and normlessness NM are more likely to practice RA and these drivers being older and possessing high scores of altruism AL, attitude to rule obedience AR, attitude to use helmet AH and family involvement FI are less likely to engage in RA. Among drivers of educated above degree, sensation seeking SS and normlessness NM significantly predict RA positively, while family involvement FI significantly predict RA negatively. This means that, drivers of educated above degree and possessing high sensation seeking SS and normlessness NM are more likely to involve in RA and these drivers scoring high on family involvement FI areless likely to employ RA. Normlessness NM appeared as a common predictor of RA among all educational groups motivating drivers to involve more in RA, consistent to the findings of Iversen and Rundmo (2002) who observed that the

drivers who scored high on normlessness NM were involved in more risky driving. An interesting finding is that influences of sensation seeking SS and family involvement are strong and high among above degree educated drivers compared to other groups.

The following independent variables failed to predict RA in different educational groups: (1) all variables other than normlessness NM and family involvement FI among Grade 10 drivers (2) all variables other than age, altruism AL, normlessness NM and family involvement FI among Grade 12 drivers (3) gender, attitude to speeding AS and commitment to safety CS among degree educated drivers and (4) all variables other than sensation seeking SS, normlessness NM, attitude to speeding AS and family involvement FI among above degree educated drivers.

5.4 DETERMINATION OF PREDICTORS OF RISKY DRIVING (SPEEDING) RS

5.4.1 Hypotheses (Whole model)

The purpose of this part of the study was to examine the effect of all independent variables (gender, age, education level, altruism AL, sensation seeking SS, normlessness NM, attitude to rule obedience AR, attitude to speeding AS, attitude to use helmet AH, family involvement FI and commitment to safety CS) on risky driving due to speeding RS. In order to achieve this, the following hypotheses were advanced.

H5.5: Demography (gender, age and education level) of the driver predict the risky driving (speeding) RS

H5.6: Personality traits (altruism AL, sensation seeking SS and normlessness NM) of the driver predict the risky driving (speeding) RS

H5.7: safety attitudes (attitude to rule obedience AR, attitude to speeding AS and attitude to use helmet AH) of the driver predict the risky driving (speeding) RS

H5.8 Family climate for road safety (family involvement FI and commitment to safety CS) of the driver predict the risky driving (speeding) RS

5.4.2 Results and Discussions

5.4.2.1 Regression Model for RS

The result of hierarchical regression analysis is displayed in Table 5.3. It revealed that at step one, gender, age and education contributed significantly to the regression model, $F_{(3, 1295)} = 38.21$, $p < .001$) and accounted for 8.1% of the variation in risky driving RS. The personality traits explained an additional 43.2% of variation in risky driving RS and this change in R^2 was significant, $F_{(6, 1292)} = 226.72$, $p < .001$. Adding attitude variables to the regression model explained an additional 5.8% of the variation in RS and this change in R^2 was significant, $F_{(9, 1289)} = 190.33$, $p < .001$. Finally, in Step 4 the addition of family climate for road safety to the regression model explained an additional 0.5% of the variation in RS and this change in R^2 square was also significant, $F_{(11, 1287)} = 159.23$, $p < .001$. Altogether the eleven independent variables accounted for 57.6% of the variance in RS.

The final step of the hierarchical regression model (Table 5.3) revealed that all the demographical variables (gender, age and education) significantly predict RS. Thus, hypothesis H5.5 is fully supported. All three personality traits (altruism AL, sensation seeking SS and normlessness NM) significantly predict risky driving RS. Thus, hypothesis H5.6 is fully supported. All the three attitudes (rule obedience,

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speeding and use helmet) significantly predict risky driving RS. Thus, hypothesis H5.7

is fully supported. In the case of family climate for road safety, family involvement FI

and Commitment to safety CS significantly predict the risky driving RS (Table 5.3).

Thus, hypothesis H5.8 on RS is fully supported.

Table 5.3 Hierarchical Regression Analyses: Predicting Risky Driving RS (β values)

Predictors	Step 1	Step 2	Step 3	Step 4
Gender	.15**	.11**	.10**	.09**
Age	-.16**	-.11**	-.08**	-.08**
Education	-.19**	.02	.05**	.05*
Altruism AL		-.35**	-.23**	-.24**
Sensation seeking SS		.14**	.06*	.07*
Normlessness NM		.33**	.19**	.20**
Attitude (rule obedience) AR			-.17**	-.17**
Attitude (speeding) AS			-.17**	-.17**
Attitude (helmet usage)			-.12**	-.12**
Family involvement FI				-.07*
Commitment to safety CS				-.10**
F	38.21**	226.72**	190.33**	159.23**
Model R²	.081	.513	.571	.576
R² Change	.081	.432	.058	.005

** p < .01; * p < .05

It is evident from Table 5.3 that altruism AL significantly predicts RS negatively

indicating that altruists reduce risk due to speeding as a result of their concern for others.

This result is consistent to Ulleberg and Rundmo (2003) who found that drivers scoring

high on altruism AL were more likely to have a positive attitude towards traffic safety

and were less likely to report risky driving in traffic. This study also found that

normlessness NM and sensation seeking SS significantly predict the risky driving RS

positively, supporting the findings of Jonah (1997) who observed that drivers with a

high score in sensation seeking drive fast and more often while drunk, possibly because

of their perceived superior driving skills. The relationship

between normlessness NM and risky driving RS is strong and consistent to Nordfjarnet al. (2014) who observed that normless drivers involve in this behaviour to serve specific purposes. Altruism AL emerged as the strongest predictor of RS among the personality traits, with normlessness NM as the second predictor.

Three attitudinal variables (attitude to rule obedience AR, attitude to speeding AS and attitude to use helmet AH) influence RS negatively, which indicate that as attitude scores increase, the risky driving RS diminish, consistent to Sukor et al. (2016) who found that attitude towards speeding are likely to affect speeding behaviour. Fernandes, Job and Hatfield (2007) found that attitudes appear to be the strongest predictor of risky driving, even after controlling for the effects of age, gender and personality traits. In the case of attitude to use helmet AH, Donate-Lopez et al. (2010) found that wearing a helmet does not increase the risk of being involved in a motorcycle crash. It appears that attitude to use helmet failed to predict RS among females because most of the female drivers use helmet compared to males. The findings that the attitude variables significantly and negatively influence RS open an avenue for intervention initiatives by authorities to reduce risky driving due to speeding of two-wheeler drivers.

In the case of family climate for road safety, family involvement FI and commitment to safety CS significantly predict the risky driving RS (Table 5.3). This is consistent to the findings of Taubman-Ben-Ari, et al. (2014) who found that young drivers who perceived their parents to be better role models for safe driving tended to report taking risks less frequently and driving more carefully. These finding points out that better driving habit can be inculcated among the youngsters by their parents. Thus, from the previous discussions it can be concluded that gender, education, sensation seeking SS

and normlessness NM had positive relationships with risky driving (speeding) RS, while age, altruism AL, all three safety attitudes to (rule obedience AR, speeding AS and use helmet AH) and family involvement FI and commitment to safety CS were all negatively correlated to risky driving RS. This implies that educated male drivers with sensation seeking SS and normlessness NM are more likely to engage in RS. This result is similar to Md Nor and Abdullah (2014) who found that the male drivers were more inclined to drive above the speed limit compared to the female drivers. Also, it is concluded that drivers of the older age band possessing high altruism AL, safety attitude to (rule obedience AR, speeding AS and use helmet AH) and family involvement FI and commitment to safety CS are less likely to engage in risk due to speeding RS. This is consistent to Tseng (2013) who found that the younger age group (20-29 years) often committed speeding violations.

5.4.3 Comparison of results of Regression analysis of Risk (speeding) RS of Sub Groups

Table 5.4 presents the results of hierarchical regression analysis on RS among the eight sub models. Among the male models, the positive significant predictors of RS are found to be education, sensation seeking SS, normlessness NM and negative significant predictors of RS are found to be attitude to rule obedience AR, helmet usage AH and commitment to safety CS. This means that, males being educated who use sensation seeking SS and normlessness NM are more likely to engage in RS and these drivers who use AR, AS and CS are less likely to engage in RS. In the case of female model, altruism AL and normlessness NM significantly predict RS. The finding that altruism was significant among females and insignificant among males is consistent to Chen (2009) who found that altruism appears to have a more significant

influence in reducing female drivers" risky driving than in males. Normlessness is found to be the common predictor of gender models with a stronger influence on males compared to female drivers on RS. Similar results were found in Nordfjarn et al. (2014), who reported that people of either sex with strong normlessness trait tendencies speed excessively. It appears that attitude to use helmet failed to predict RS among females because most of the female drivers use helmet compared to males. Moreover, SS is significant only among males which motivate them to involve in risky driving due to speeding consistent to Cestac, Paran and Delhomme (2011) who reported that sensation seeking influenced men's intention to engage in speeding but not women's.

Table 5.4 Hierarchical Regression Analyses on Sub Models: Predicting Risky Driving (Speeding) RS

	Gender (β values)		Age (β values)			Education (β values)		
	Male	Female	25 and below	above 25	Grade 10	Grade 12	Degree	Above Degree
N =	1089	210	644	655	216	350	525	208
R² =	.796	.519	.500	.633	.816	.513	.456	.887
F =	419**	21.5**	63.3**	111**	90.6**	35.7**	43.1**	155**
Age	-.03	-.02	-	-	.01	-.14**	-.15**	.07*
Gender	-	-	.12**	.07**	.04	.14**	.13**	.02
Edu	.08**	.09	.05	.05*	-	-	-	-
AL	-.08	-.39**	-.24**	-.25**	-.20**	-.28**	-.18**	.08
SS	.41**	.12	.09*	.04	.12*	-.04	.04	.54**
NM	.50**	.21**	.18**	.23**	.23**	.15**	.20**	.35**
AR	-.07*	-.09	-.16**	-.17**	-.13**	-.15**	-.16**	-.11
AS	.02	-.12	-.16**	-.19**	-.14*	-.16**	-.19**	.01
AH	-.14**	.11	-.09*	-.15**	-.28**	-.12*	-.09*	-.06
FI	-.01	-.14	-.10*	-.04	-.08	-.01	-.12*	-.16
CS	-.25**	.02	-.13**	-.09*	.17	.08	-.11*	-.26*

** $p < .01$; * $p < .05$; Edu: education; AL: altruism AL; SS: sensation seeking; NM: normlessness NM; AR: attitude (rule obedience); AS: attitude (Speeding); AH: attitude (helmet use); FI: family involvement; CS: commitment to safety

From Table 5.4, it can be seen that among drivers of younger age (below 26 years) all independent variables except education significantly predict RS. That is males among young drivers who use sensation seeking SS and normlessness NM are more likely to

engage in RS, while young drivers who use altruism and all variables of attitudes and family climate for road safety are less likely to involve in RS. In the case of older age band all independent variables significantly predict RS except sensation seeking and family involvement. That is educated males among older drivers who use normlessness NM are more likely to engage in RS. Gender, altruism, normlessness NM and three attitudinal variables and commitment to safety CS emerged as common predictors of both the age groups. The influence of the trait normlessness NM is higher on older age band, compared to younger age band. These findings on the effect of traits on risky driving are consistent to Ulleberg and Rundmo (2003) who found that high scores on sensation seeking and normlessness were associated with both risk-taking attitudes (i.e. negative attitudes towards traffic safety) and risky driving behaviour. The safety attitudes AR (attitude to rule obedience) and AS (attitude to speeding) are found to have more influence on the older age band, confirming the findings of Sukor et al. (2016) who observed that younger PTW riders tend to have a greater attitude to engage in speeding than do older riders. One possible reason for the high frequency of young drivers" risky behaviour is that young drivers are more likely to drive too fast, tailgate, fail to give way to pedestrians. Also helmet usage is found to have higher influence on RS among the drivers of the older age band. Similar findings were found in Donate-Lopez et al. (2010) who reported that wearing a helmet does not increase the risky driving and Kulanthayan et al. (2001) who reported that the proper usage of safety helmet was higher for motorcyclists above 20 years of age. The influence of FI on risky driving is seen only in the younger age band as the role changes from a youngster to a senior/parent as one comes to the latter half of twenties.

In the case of educational groups (Table 5.4), age significantly predicts RS among all drivers except Grade 10 educated and gender of the driver significantly predicts RS among Grade 12 and degree educated drivers. This indicates that young, male with Grade 12 and degree level educations are more vulnerable to RS than any other group. All personality traits (altruism AL, sensation seeking SS and normlessness NM) and all attitudinal variables (attitude to rule obedience AR, attitude to speeding AS and attitude to helmet usage AH) significantly predict RS in the model of drivers of Grade 10. In the case of Grade 12 model, age, gender and two personality traits (AL and SS) and all attitudinal variables (AR, AS and AH) significantly predict RS. Among the drivers educated up to degree, two personality traits (AL and NM) and all attitudinal variables (AR, AS and AH) and family involvement FI significantly predict RS. In the case of drivers educated above degree age, sensation seeking SS and normlessness NM significantly predict RS.

Altruism is found to be a common predictor among drivers of Grades 10 and 12 and degree educated, with a higher influence on Grade 12 drivers resulting in a reduction of RS consistent to Ulleberg and Rundmo (2003) who found that drivers scoring high on altruism were less likely to report risky driving on roads. Sensation seeking is found to be a common predictor among Grade 10 and above degree educated, with a higher influence on above degree educated drivers. Normlessness is found to be a common predictor among all educated groups, with a higher influence on above degree educated drivers. These indicate that drivers with higher education and scoring high on normlessness are having greater association with speeding violations, consistent to Tseng (2013) and Shinar et al. (2001) who found that speeding violations are associated with higher education. Also, it is consistent to Oltedal and

Rundmo (2006) who reported that normlessness may relate to a general tendency of irresponsibility and therefore be of importance to driving behaviour at large. Safety attitudes (attitude to rule obedience AR and attitude to speeding AS) are found to be common predictors among Grades 10 and 12 and degree educated groups, with a higher influence on degree educated drivers resulting in the reduction of RS, consistent to Ulleberg and Rundmo (2003). Attitude to use helmet is found to be a common predictor among Grades 10 and 12 and degree educated groups, with a higher influence on Grade 10 drivers resulting in the reduction of RS. Among the degree model, family involvement significantly predicts RS and family involvement and commitment to safety significantly predict RS among the drivers educated up to degree and above degree.

From the discussions given above, it can be stated that, (1) Grade 10 drivers, who score high sensation seeking SS and normlessness NM are more likely to exceed speed limit and who possess high in altruism AL and attitudes (AR, AS and AH) are less likely to exceed speed limit (2) Male drivers educated up to Grade 12, scoring high in normlessness NM are more likely to exceed speed limit and being old, scoring high in altruism AL and attitudes (AR, AS and AH) are less likely to exceed speed limit (3) Male drivers educated up to degree are more likely to exceed speed limit and older drivers educated up to degree, scoring high in altruism AL and attitudes (AR, AS and AH) and family involvement FI and commitment to safety are less likely to exceed speed limit and (4) drivers educated above degree, but, young scoring high in sensation seeking SS and normlessness NM are more likely to exceed speed limit.

5.5 DETERMINATION OF PREDICTORS OF RISKY DRIVING (RULE VIOLATION) RV

5.5.1 Hypotheses (whole model)

The purpose of this part of the study was to examine the effect of all independent variables (gender, age, education level, altruism AL, sensation seeking SS, normlessness NM, attitude to rule obedience AR, attitude to speeding AS, attitude to use helmet AH, family involvement FI and commitment to safety CS) on risky driving due to rule violation RV. In order to achieve this, the following hypotheses were advanced.

H5.9: Demography (gender, age and education level) of the driver predicts the risk due to rule violation RV.

H5.10: Personality traits (altruism AL, sensation seeking SS and normlessness NM) of the driver predict the risk due to rule violation RV.

H5.11: safety attitudes (attitude to rule obedience AR, attitude to speeding AS and attitude to use helmet AH) of the driver predict the risk due to rule violation RV.

H5.12 Family climate for road safety, (family involvement FI and commitment to safety CS) of the driver predict the risk due to rule violation RV.

5.5.2 Results and Discussions

5.5.2.1 Regression Model for RV

The results of hierarchical multiple regression analysis is presented in Table 5.5. It revealed that at step one, gender, age and education contributed significantly to the regression model, $F_{(3, 1295)} = 45.94$, $p < .001$) and accounted for 9.6% of the variation in risky driving RV. The personality traits explained an additional 45.2% of

violation in risky driving RV and this change in R^2 was significant, $F(6, 1292) = 260.80$, $p < .001$. Adding attitude variables to the regression model, in step 3 explained an additional 4% of the variation in RV and this change in R^2 was also significant, $F(9, 1289) = 204.03$, $p < .001$. Finally, in Step 4 the addition of family climate for road safety to the regression model explained an additional 1% of the variation in RV and this change in R^2 was also significant, $F(11, 1287) = 174.02$, $p < .001$. Altogether the eleven independent variables accounted for 59.8% of the variance in RV.

The fourth step of the hierarchical regression model (Table 5.5) revealed that among the demographic variables only age significantly predicts RV. Thus, hypothesis H5.9 is partially supported. This means that older drivers engage in RV less frequently. This is consistent to Parker et al. (1992) who found that the oldest drivers expressed the strongest intentions not to commit rule violations.

All three personality traits (altruism AL, sensation seeking SS and normlessness NM) significantly predict risky driving RV (Table 5.5). Thus, hypothesis H5.10 is fully supported. Altruism AL has negative influence on RV consistent to the findings of Chen (2009) who reported that altruists are expected to show active concern for others and thus reflects itself in less risky driving. Sensation seeking SS and normlessness NM significantly and positively predicted RV, with a higher influence by normlessness NM than that of sensation seeking SS. The effects of SS and NM on RV motivate the drivers to more likely to engage in RV. A plausible explanation for this is that sensation-seekers are expected to seek excitement and stimulation in traffic and individuals scoring high on normlessness NM were expected to show low barriers towards rule violation in traffic in order to achieve their goals. This is consistent to

Iversen and Rundmo (2002) who showed that there was a tendency for higher speeding and rule violations in those who score high on sensation seeking and normlessness.

Table 5.5 Hierarchical Regression Analysis: Predicting Risky Driving (rule violation) RV (β values)

Predictors	Step 1	Step 2	Step 3	Step 4
Gender	.07**	.02	.01	.01
Age	-.13**	-.07**	-.05**	-.06**
Education	-.30**	-.07**	-.03	-.03
Altruism AL		-.35**	-.24**	-.19**
Sensation seeking SS		.17**	.11**	.11**
Normlessness NM		.32**	.22**	.21**
Attitude (rule obedience) AR			-.19**	-.17**
Attitude (speeding) AS			-.03	-.02
Attitude (helmet usage) AH			-.15**	-.10**
Family involvement FI				-.16**
Commitment to safety CS				.00
F	45.94**	260.80	204.03	174.02
Model R²	.096	.548	.588	.598
R² Change	.096	.452	.040	.010

** $p < .01$

It is also seen from Table 5.5 that age, attitude to rule obedience AR and attitude to use helmet AH and family involvement significantly and negatively predict risky driving behaviour RV. Thus the hypothesis H5.11 is partially supported. This means that older drivers scoring high in attitude to rule obedience AR, attitude to wear helmet AH and family involvement are less likely to display RV. This may be related to the findings of Kulanthayan et al. (2001) who observed that helmet usage was higher, may be, due to better perception of accident risk. This result is also consistent to Iversen and Rundmo (2004) who found that attitudes towards traffic safety influenced risky behaviour in traffic, especially attitudes towards rule violations and speeding.Among family climate for road safety, family involvement significantly

predicts the risky driving RV negatively (Table 5.5). Thus, the hypothesis H5.12 is partially supported. This is consistent to the findings of Taubman-Ben-Ari, et al. (2015) who reported that when the young driver feels a stronger family bonding and perceives his family as more adaptable to different situations, these positive aspects of the family atmosphere result in safe driving of offspring. This result can be used to make awareness about the importance of family climate in the safe driving among the powered two wheeler drivers. Prominent predictors of risky driving (rule violation) RV are altruism AL, sensation seeking SS, normlessness NM, attitude to obey rules AR and family involvement FI. Attitude to speeding AS and commitment to safety CS failed to predict RV. Finally, it can be stated that the drivers with higher sensation seeking SS and normlessness NM are more likely to engage in risky driving (rule violation) RV, while older drivers with altruism AL, attitude to obey rules AR, attitude to use helmet AH and family involvement FI are less likely to engage in risky driving (rule violation) RV.

5.5.3 Comparison of results of Regression analysis of Risk (rule violation) RV of Sub Groups

Table 5.6 presents the results of hierarchical regression analysis on RV among the eight sub models. In the male drivers, significant predictors are sensation seeking SS and normlessness NM, safety attitudes to obey rules AR, use helmets AH and family involvement FI. That is male drivers with high sensation seeking SS and normlessness NM are more likely to involve in RV, while these drivers with higher levels of attitudes to obey rules AR, use helmets AH and family involvement FI are less likely to involve in RV.

Table 5.6 Hierarchical Regression Analyses on Sub Models:
Predicting Risky Driving RV

	Gender (β values)		Age (β values)		Education (β values)			
	Male	Female	25 and below	above 25	Grade 10	Grade 12	Degree	Above Degree
N =	1089	210	644	655	216	350	525	208
R² =	.791	.479	.516	.661	.807	.548	.423	.866
F =	407**	18.3**	67.5**	125**	85.7**	41.2**	37.7**	126**
Age	.03	-.08	-	-	-.02	-.05	-.10*	-.01
Gender	-	-	-.01	.04	.02	.05	.01	.01
Edu	.01	-.01	-.03	-.02	-	-	-	-
AL	-.05	-.13	-.21**	-.17**	-.14*	-.26**	-.17**	-.35*
SS	.43**	.22**	.11**	.10**	.10	.07	.09*	.71**
NM	.53**	.15*	.22**	.22**	.25**	.23**	.20**	.37**
AR	-.07*	-.18**	-.18**	-.17**	-.10	-.14**	-.21**	-.16
AS	.17	.03	.02	-.06	-.03	-.09	.02	.18
AH	-.14**	-.03	-.06	-.15**	-.27**	.07	.06	-.09
FI	-.12**	-.20*	-.18**	-.12**	-.16**	-.11*	-.17**	-.64**
CS	.12	-.01	.01	-.01	.05	.05	-.03	.21

** $p < .01$; * $p < .05$; Edu: education; AL: altruism AL; SS: sensation seeking; NM: normlessness NM; AR: attitude (rule obedience); AS: attitude (Speeding); AH: attitude (helmet use); FI: family involvement; CS: commitment to safety

In the female model the significant positive predictors of RV are found to be sensation seeking, normlessness NM, and significant negative predictors are found to be attitude to obey rules AR and family involvement FI. That is female drivers with high sensation seeking SS and normlessness NM are more likely to practice RV, while these drivers with high attitude to obey rules AR and family involvement FI are less likely to employ RV. Common predictors of risky driving RV of both male and female models are sensation seeking SS, normlessness NM and attitude to obey rules AR and family involvement FI. It is seen that sensation seeking SS and normlessness NM among male model are stronger predictors than the predictors of female model indicating that, males are more involved in RV than females consistent to Cestac, Paran and Delhomme (2011) who stated that sensation seeking influenced men's

intention but not women's and Oltedal and Rundmo (2006) who found that males with high normlessness are more involved in risky driving compared to females. Nordfjarn et al. (2014) found that people with strong normlessness tendencies not only speed excessively and violate road traffic regulations. In both gender models altruism AL, attitude to speeding AS and commitment to safety CS failed to predict RV. Influence of attitude to obey rules AR and family involvement FI is considerably high in the female model compared to males, resulting in the reduction of RV. This is possibly due to the law-abiding nature and parental bonding of females consistent to Yagil (1998) who found that compliance with traffic laws among women is more strongly related to the perceived danger involved in rule violations, than in men. Attitude to use helmets AH among the males significantly predict RV, while in female model influence of AH is insignificant. This can be attributed to the fact that most of female riders use helmets while riding.

In the younger age groups, sensation seeking SS and normlessness NM are the significant positive predictors of RV, while altruism AL, attitude to rule obedience AR and family involvement FI are significant negative predictors. This means that young drivers are more likely to employ RV when they use sensation seeking SS and normlessness NM consistent to Machin and Sankey (2008) who found that personality traits, such as sensation seeking are significantly correlated to driving behaviour. Also, Chen (2009) found that sensation seeking and normlessness were related to risky driving (rule violation). Among the drivers of the older age band sensation seeking SS and normlessness NM had a positive significance and altruism AL, attitude to rule obedience AR, use helmet AH and family involvement FI had a negative significant relationship with RV. This means that older drivers are more likely to employ RV when they use sensation seeking SS and normlessness NM and these drivers are less likely to

employ RV when they use altruism AL, attitude to rule obedience AR, use helmet AH and family involvement FI. The personality traits (altruism AL, sensation seeking SS and normlessness NM), attitude to rule obedience AR and family involvement FI are the common significant predictors among both age groups on RV. Influence of altruism AL on RV is high among younger drivers may be because they are concerned with other road users. While the influence of sensation seeking SS and normlessness NM and attitude to rule obedience AR is almost the same among both age models, indicating that the contribution of these variables on rule violation is almost same irrespective of age. Influence of attitude to use helmet AH in the older age reduces RV compared to younger drivers. This result is in tune with Hung, Stevenson and Ivers (2008) who found that older drivers and higher levels of education were found to be key determinants of helmet use. Influence of family involvement on risky driving RV is higher in younger age band compared to older age band, reducing RV. Gender, education, AS and CS failed to predict RV in both age groups.

In the case of educational groups Table 5.6 reveal that, among Grade 10 riders, normlessness NM significantly and positively predict risk (rule violation), while altruism AL, attitude to use helmet AH and family involvement FI significantly and negatively predict risk (rule violation). That is Grade 10 riders are more likely to involve in RV when they use normlessness and they less likely to involve in RV when they use altruism AL, attitude to use helmet AH and family involvement FI. Among Grade 12 driver's normlessness NM significantly and positively predict risk (rule violation), while altruism AL, attitude to rule obedience AR and family involvement FI significantly and negatively predict risk (rule violation). That means, Grade 12 drivers are more likely to engage in RV when they use normlessness NM, while they

less likely engage in RV when they use altruism AL, attitude to rule obedience AR and family involvement FI. Among degree educated drivers, sensation seeking SS and normlessness NM significantly and positively predict risk (rule violation), while age, altruism AL, attitude to rule obedience AR and family involvement FI significantly and negatively predict risky driving RV. This means that degree educated drivers are more likely to engage in RV when they use sensation seeking SS and normlessness NM. Older drivers among educated up to degree who use altruism AL, attitude to rule obedience AR and family involvement FI are less likely to involve in RV. Among educated drivers of above degree sensation seeking SS and normlessness NM significantly predict RV positively while altruism AL and family involvement FI significantly predict RV negatively. This shows that educated drivers of above degree are more likely to engage in RV when they use sensation seeking SS and normlessness NM while they less likely to engage in RV when they use altruism AL and family involvement FI. Normlessness NM and family involvement FI appeared as the common predictors of RV in all four models based on education and influence of sensation seeking, normlessness NM and family involvement are higher among drivers of above degree educated compared to other groups. This is an interesting finding that among drivers of above degree education also, there are sensation seekers and normless persons. Similar reports were found in Dahlen et al. (2005) who found that sensation seeking and altruism are significantly related with driving behaviour. Influence of attitude to rule obedience AR on RV is high among drivers educated up to degree, compared to Grade 12 drivers consistent to Tseng (2013) who revealed that drivers with college education have less speeding tickets per million km compared to middle and less educated drivers. Gender, attitude to speeding and commitment to safety CS failed to predict RV in all the four educational groups.

5.6 DETERMINATION OF PREDICTORS OF DRUNKEN DRIVING DD

5.6.1 Hypotheses (whole model)

The purpose of this part of the study was to examine the effect of all independent variables (gender, age, education level, altruism AL, sensation seeking SS, normlessness NM, attitude to rule obedience AR, attitude to speeding AS, attitude to use helmet AH, family involvement FI and commitment to safety CS) on drunken driving DD. In order to achieve this, the following hypotheses were advanced.

H5.13: Demography (gender, age and education) of the driver predict the drunken driving DD.

H5.14: Personality traits (altruism AL, sensation seeking SS and normlessness NM) of the driver predict the drunken driving DD.

H5.15: safety attitudes (attitude to rule obedience AR, attitude to speeding AS and attitude to use helmet AH) of the driver predict the drunken driving DD.

H5.16: Family climate for road safety (family involvement FI and commitment to safety CS) of the driver predict the drunken driving DD.

5.6.2 Results and Discussions

5.6.2.1 Regression Model for Drunken Driving DD

The results of hierarchical multiple regression analysis are presented in Table 5.7. It revealed that at step one, gender and education contributed significantly to the regression model, $F_{(3, 1295)} = 35.35$, $p < .001$) and accounted for 7.6% of the variation in drunken driving DD (Table 5.7). The personality traits explained an additional 42% of variation in DD and this change in R^2 was significant, $F_{(6, 1292)} = 212.08$, $p < .001$. Adding attitude variables to the regression model explained an additional 2% of the variation in DD and this change in R^2 was also significant, F

(9,1289) = 152.92, p < .001. Finally, in Step 4 the addition of family climate for road safety to the regression model explained an additional 2.9% of the variation in DD and this change in R² square was also significant, F (11, 1287) = 142.06, p < .001. Altogether the eleven independent variables accounted for 54.5% of the variance in DD.

The final step of the hierarchical regression analysis model (Table 5.7) revealed that among demography, gender significantly predicts drunken driving DD. Thus, the hypothesis H5.13 is partially supported. This indicates that male drivers are more involved in drunken driving DD than females, consistent to Leadbeater, Foran, and Grove-White (2008) who found that males were more involved in alcohol-related crashes than females. Age and education failed to predict drunken driving DD.

It is evident from Table 5.7 that, all three personality traits (altruism AL, sensation seeking SS and normlessness NM) significantly predict drunken driving DD. Thus, hypothesis H5.14 is fully supported. The relationship between altruism AL and drunken driving DD indicated that drivers who are more concerned about others are less likely to drive while intoxicated than those who are less concerned about others. This is consistent to Ge et al. (2014) who found that altruism AL significantly and negatively correlated to DD. The relationship between sensation seeking SS and drunken driving is positive in tune with González-Iglesias et al. (2014) who found that sensation seeking was positively correlated with favourable attitudes to driving under the influence of alcohol. Similar reports were found in Zakletskaia et al. (2009). An interesting finding obtained in the present study is the positive relationship between normlessness NM and drunken driving DD.

Table 5.7 Hierarchical Regression Analyses: Predicting Drunken driving DD (β values)

Predictors	Step 1	Step 2	Step 3	Step 4
Gender	.13**	.09**	.08**	.09**
Age	-.05	.01	.00	.01
Education	-.23**	-.02	-.00	.01
Altruism AL		-.33**	-.23**	-.14**
Sensation seeking SS		.21**	.17**	.14**
Normlessness NM		.26**	.19**	.17**
Attitude (rule obedience) AR			-.09**	-.06*
Attitude (speeding) AS			-.05	-.04
Attitude (helmet usage) AH			-.14**	-.04
Family involvement FI				-.16**
Commitment to safety CS				-.18**
F	35.35**	212.08**	152.92**	142.06**
Model R²	.076	.496	.516	.545
R² Change	.076	.420	.020	.029

** $p < .01$

Attitude to rule obedience AR significantly and negatively predicts drunken driving DD. Thus, the hypothesis H5.15 is partially supported. This can be attributed to the fact that, drivers who obey traffic rules are involved less in DD. Another finding on drunken driving is given by Kulick and Rosenberg (2009) who inferred that the reason for driving after drinking was the drivers perceived need or desire to go to his/her destination (e.g. home, grocery). In the case of family climate for road safety on DD, family involvement FI and commitment to safety CS predict drunken driving DD. Thus, the hypothesis H5.16 is fully supported.

Drunken driving is a kind of distracted driving, which is influenced by low SES individuals and non-committed drivers (less-educated, low parental bonding and non-commitment attitude to safety). Similar results were found in Shopeet al. (2001) who found that negative parental influences (lenient attitudes toward young people's drunken driving), were also demonstrated to increase the risk of serious offences and

serious crashes for both men and women. Altruism AL, sensation seeking SS, normlessness NM and family involvement FI and commitment to safety CS were the more prominent predictors of drunken driving DD. Age, education, AS and AH failed to predict drunken driving DD. Hence it can be concluded that male drivers who use high sensation seeking SS and normlessness NM are more likely to drive after drinking, while the drivers who use high altruism AL, attitude to rule obedience AR, family involvement FI and commitment to safety CS do involve less in drunken driving DD.

5.6.3 Comparison of results of Regression analysis of Drunken driving DD of Sub Groups

Table 5.8 presents the results of hierarchical regression analysis on drunken driving DD among the eight sub models. In the male model, the positive and significant predictors of drunken driving DD are found to be age, education, sensation seeking SS, normlessness NM, while the negative and significant predictors of DD are found to be attitude to speeding AS, helmet usage AH, family involvement FI and commitment to safety CS. This result indicates that, male drivers being young and educated with high scores of sensation seeking SS and normlessness NM are more likely to involve in drunken driving DD. When males use attitude to speeding AS, helmet usage AH, family involvement FI and commitment to safety CS, they are less likely to engage in DD.

In the case of female model, the significant predictors are attitude to helmet use AH, family involvement FI and commitment to safety CS, which significantly reduce their tendency to drunken driving. These results are consistent to Jonah (1997) and Parker et al. (1992) who found males are more involved in drunken driving compared to females. Role of family involvement FI and commitment to safety CS indicate a

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person's attitude to safe driving that refrain such peoples from drunken driving consistent to Taubman – Ben-Ari, et al. (2015) who reported that the family climate and the family members" attitude toward road safety significantly contribute to driving behaviour. Influence of normlessness NM on DD in the male model shows drunken driving tendency among the normless males. Family involvement FI and commitment to safety CS appeared to be the common predictors of DD among both gender groups. Altruism AL and attitude to rule obedience AR among males and age, education, all personality traits and attitudinal variables among females failed to predict DD.

Table 5.8 Hierarchical Regression Analyses on Sub Models: Predicting Drunken driving DD

	Gender (β values)		Age (β values)		Education (β values)			
	Male	Female	25 and below	above 25	Grade 10	Grade 12	Degree	Above Degree
N =	1089	210	644	655	216	350	525	208
R² = F =	.736 294**	.238 6.2**	.456 53.1**	.635 112**	.793 78.7**	.545 40.6**	.354 28.1**	.797 77.1**
Age Gender Edu	.06** - .07**	-.10 - -.07	- .08* -.01	- .12** .03	.03 .12** -	.02 .12** -	-.03 .10 -	-.01 .02 -
AL SS NM	-.06 .50** .48**	-.00 .14 .16	-.09* .15** .18**	-.19** .10** .16**	-.12 .15* .27**	-.14* .19** .10	-.13** .07 .19**	-.09 .57** .36**
AR AS AH FI CS	.01 -.13** -.13** -.16** -.10*	.05 -.09 -.23* -.23* -.17*	-.03 .01 -.01 -.22** -.17**	-.09* -.09* -.09* -.07 -.18**	.02 -.16* .06 -.17* -.21**	-.11 .00 -.06 -.18** -.18**	-.07 .00 -.06 -.11* -.19**	-.14 -.05 .04 -.16 -.38*

** $p < .01$; * $p < .05$; Edu: education; AL: altruism AL; SS: sensation seeking; NM: normlessness NM; AR: attitude (rule obedience); AS: attitude (Speeding); AH: attitude (helmet use); FI: family involvement; CS: commitment to safety

Regression analyses on age groups reveal that among younger drivers, gender, sensation seeking and normlessness positively and significantly predict DD, showing that males among younger drivers with high sensation seeking SS and normlessness

NM are more likely to engage in driving while intoxicated. However, young riders who use altruism AL, family involvement FI and commitment to safety CS are less likely to engage in driving while intoxicated. Marcil et al. (2001) found that young, males' intention to drink and drive is predicted by their attitudes. Also, Fernandes, Job and Hatfield (2007) found that drunken driving was significantly predicted by sensation seeking and specific attitude to drunken driving. In the older age group, gender, sensation seeking and normlessness positively and significantly predict DD, with a lower influence of SS and NM on DD, than in the young age group. This means that involvement of younger drivers on DD is higher than in old drivers. The trait altruism AL, attitude to rule obedience AR, attitude to speeding AS and attitude to use helmet AH and commitment to safety CS significantly predict DD negatively in the older age band, indicating that the older age band drivers with high scores of altruism AL, attitude to rule obedience AR, attitude to speeding AS and attitude to use helmet AH and commitment to safety CS are less likely to employ in DD. The common predictors of DD among both age bands are three personality traits (altruism AL, sensation seeking SS and normlessness NM) and commitment to safety CS. Altruism AL influence on DD more in the older age band compared to younger age band, indicating older drivers' concern for other road users, resulting in the reduction of DD. Influence of attitudinal variables AR, AS and AH are significant among older age group and insignificant among younger age. Family involvement is significant among young drivers, while it is insignificant among older drivers. It is also found that the influence of commitment to safety reduces DD in both age models. This may be due to the drivers, having the commitment towards safety, are interested in the safety of themselves as well as others.

Literature on the relationship of normlessness, family involvement and commitment to safety with drunken driving are scarce. From these discussions, this study observes that young drivers are more involved in drunken driving than older drivers.

From the educational models presented in Table 5.8, it is evident that among Grade 10 drivers, gender, sensation seeking, normlessness positively and significantly predict DD, whilst attitude to speeding, family involvement and commitment to safety significantly and negatively predict DD. That is males, among Grade 10 drivers who use sensation seeking SS and normlessness NM are more likely to engage in DD, while Grade 10 drivers who use AS, FI and CS are less likely to engage in DD. Among the drivers of Grade 12 educated, gender and sensation seeking SS positively and significantly predict DD, while altruism AL, family involvement FI and commitment to safety CS significantly and negatively predict DD. That is males of Grade 12 who use SS are more likely to engage in DD, while Grade 12 drivers who use AL, FI and CS are less likely to engage in DD. Drivers educated up to degree who use normlessness NM are more likely to engage in DD, since NM positively and significantly predict DD. Also, drivers educated up to degree who use AL, FI and CS are less likely to engage in DD as altruism AL, family involvement FI and commitment to safety CS significantly and negatively predict DD. Drivers educated above degree who possess high SS and NM are more likely to engage in DD. These results demonstrate that male drivers of Grade 10 with high scores of sensation seeking SS, and normlessness NM are involved more in DD than drivers of Grade 12 as well as degree educated. This finding is consistent to Romano et al. (2012) who found that drivers with lower than 12 years of education were 1.62 times more likely

to be involved in alcohol-related crashes than drivers with 12–14 years of education. It is also found that drivers of above degree education had higher scores of sensation seeking SS and normlessness NM compared to other educated groups forcing them to involve more in drunken driving DD. Influence of altruism AL on DD among the drivers of Grade 12 and up to degree education is almost the same and its effect on other groups is insignificant. This may be explained as altruists of these educated groups are concerned about others safety. Effect of sensation seeking SS among all drivers except degree educated is significant and its influence is high among above degree educated. This is an interesting finding highlighting the presence of sensation seeking group among above degree educated drivers. This result may be related to the findings of Wong, Chung and Huang (2010) who found that the riders with high scores in sensation seeking are highly comfortable with unsafe riding and interested in the utility gained from it, making them highly prone to risky riding behaviour. Effect of normlessness on DD among all drivers except Grade 12 educated is significant and its influence is high among above degree educated, suggesting the necessity for safety awareness programmes among above degree educated drivers. Influence of family involvement and commitment to safety on DD among all drivers except above degree educated is significant reducing DD among these educated groups. This may be related to the findings of Bianchi and Summala (2004) who observed that parents' risky driving influenced their children's driving and the relationship between children's and parents risky driving were positive and significant, pointing out that the errors and violations occur among parents, the more of such specific behaviour can be expected from their children.

The following variables failed to predict DD: (1) among Grade 10 drivers-age, altruism AL, attitude to rule obedience AR and use helmet AH (2) among Grade 12 drivers-age, normlessness NM, attitudinal variables (AR, AS and AH) (3) among drivers educated up to degree-age, gender, sensation seeking SS and attitudinal variables (AR, AS and AH) and (4) among drivers educated above degree-age, gender, altruism, attitudinal variables (AR, AS and AH) and family involvement FI.

5.7 DETERMINATION OF PREDICTORS OF CELL PHONE USAGE CU

5.7.1 Hypotheses (whole model)

The purpose of this part of the study was to examine the effect of all independent variables gender, age, education level, altruism AL, sensation seeking SS, normlessness NM, attitude to rule obedience AR, attitude to speeding AS, attitude to use helmet AH, family involvement FI and commitment to safety CS) on cell phone usage CU. In order to achieve this, the following hypotheses were advanced.

H5.17: Demography (gender, age and education level) of the driver predicts the cell phone usage CU.

H5.18: Personality traits (altruism AL, sensation seeking SS and normlessness NM) of the driver predict the cell phone usage CU.

H5.19: safety attitudes (attitude to rule obedience AR, attitude to speeding AS and attitude to use helmet AH) of the driver predict the cell phone usage CU.

H5.20 Family climate for road safety (family involvement FI and commitment to safety CS) of the driver predict the cell phone usage CU.

5.7.2 Results and Discussions

5.7.2.1 Regression Model for cell phone usage CU

Table 5.9 displayed the results of hierarchical multiple regressions on cell phone usage CU which reveals that, the models explained between 3.7% and 36.6% of the variance

in (CU). In step1, demography accounted for a significant 3.7% of the variance and this was significant, $F_{(3, 1295)} = 16.45$, $p < .001$. The addition of personality traits in step 2, accounted for an additional, significant 27.5% of the variance and this change in R^2 was significant, $F_{(6, 1292)} = 97.47$, $p < .001$. The subsequent addition of attitudes in step 3, accounted for an additional, significant 3.4% of the variance and this change in R^2 was also significant, $F_{(9, 1289)} = 75.78$, $p < .001$. The further addition of social factors in step 4, accounted for an additional, significant 2% of the variance and this change in R^2 was also significant, $F_{(11, 1287)} = 67.60$, $p < .001$.

Table 5.9 Hierarchical Regression Analyses:
Predicting cell phone usage CU (β values)

Predictors	Step 1	Step 2	Step 3	Step 4
Gender	.07**	.04	.04	.04
Age	-.12**	-.04	-.04	-.05*
Education	-.13**	.02	.04	.06
Altruism AL		-.16**	-.07*	-.00
Sensation seeking SS		.25**	.18**	.15**
Normlessness NM		.24**	.13**	.12**
Attitude (traffic flow vs rule obedience) AR			-.05	-.03
Attitude (speeding) AS			-.20**	-.19**
Attitude (helmet usage) AH			-.09**	-.02
Family involvement FI				-.10**
Commitment to safety CS				-.15**
F	16.45**	97.47**	75.78**	67.60**
Model R^2	.037	.312	.346	.366
R^2 Change	.037	.275	.034	.020

** $p < .01$; * $p < .05$

The final step of the hierarchical regression model (Table 5.9) revealed that age predicts CU significantly. Thus, the hypothesis H5.17 is partially supported. Among personality variables altruism failed to predict CU, thus the hypothesis H5.18 is partially supported. It also reveals that education, sensation seeking SS and normlessness NM positively and significantly predict cell phone usage CU, whilst significant and negative predictors of CU are, age, attitude to speeding AS, family

involvement FI and commitment to safety CS. This shows that educated drivers with high sensation seeking SS and normlessness NM are more likely to use cell phone, while old drivers with high scores of attitude to speeding AS, family involvement FI and commitment to safety CS are less likely to engage in CU.

The influence of age on CU is negative which can be interpreted as usage of cell phone among older age is low, consistent to Tractinsky et al. (2013) who found that young drivers are more likely to initiate calls than older and experienced drivers. Though CU was initially predicted by gender and education, it was then superseded by a set of more dominant personality or attitudinal predictors, leaving only age (among demography) as a significant predictor of CU. Among the attitudinal variables, only attitude to speeding AS is found to significantly predict CU, causing a reduction in CU. Thus, the hypothesis H5.19 is partially supported.

Among the attitudinal variables, attitude to speed predict CU. This is possibly due to the riders who have the attitude to reduce speed are less likely to use cell phone, consistent to Pöysti et al. (2005) who found that law-abiding and safety-oriented drivers used their phones less frequently. Also, driving records of cell phone users revealed that they had higher counts of violations, including speeding, alcohol, and failure to use PPE (Wilson et al., 2003). In the case of family climate for road safety, family involvement FI and commitment to safety CS significantly predict cell phone usage CU. Thus, the hypothesis H5.20 is fully supported. The drivers with high scores of family involvement FI and commitment to safety CS use cell phone less while driving. The relationship of family involvement FI and commitment to safety CS with CU has not been widely explored. In the final step of the equation, the significant and prominent predictors of cell phone usage CU are age, sensation seeking, normlessness, attitude to

speeding, family involvement and commitment to safety. Gender, education, altruism AL, attitude to rule obedience AR, and attitude to use helmet AH failed to predict CU.

5.7.3 Comparison of results of Regression analysis of Cell phone usage CU of Sub Groups

Table 5.10 presents the results of hierarchical regression analysis on cell phone usage CU among the eight sub models. Among male model, education, sensation seeking SS and normlessness NM significantly and positively predict CU, while altruism AL predict significantly and negatively. In the female model normlessness positively and significantly predicts CU, while attitude AS and commitment to safety significantly and negatively predict CU. The influence of NM in males is higher than in females. That is educated drivers among male with higher scores of sensation seeking and normlessness are more likely to involve in CU, than females. This result is consistent to Brusque and Alauzet (2008) who found that CU is much greater among males than among females. Normlessness NM emerged as the common predictor of cell phone usage in male and female models. Pileggi et al. (2006) found that motorcycling with cell phone usage and under the influence of alcohol was higher in males. Further, altruists among male drivers are less likely to use cell phone. The factors that reduce the usage of cell phone among females are attitude to speeding AS (β = -.24, p < .01) and commitment to safety CS (β = -.20, p < .01). This is consistent to Pöysti, Rajalin and Summala (2005) who found that law-abiding and safety-oriented drivers used their phones less frequently. Age, all attitudinal variables (AR, AS and AH), FI and CS among males and age, education, AL, SS, AR, AH and FI among females failed to predict CU.

In the case of age models, Table 5.10 reveals that among younger drivers, sensation seeking and normlessness positively and significantly predict CU, while negative and significant predictors are attitude to speeding, family involvement and commitment to safety. That is young drivers with high sensation seeking SS and normlessness NM are more likely to use cell phone, and these drivers with attitude to speeding AS, family involvement FI and commitment to safety CS are less likely to use cell phone.Among the older age drivers, it is seen that education, sensation seeking and normlessnesspositivelyandsignificantlypredictCUwhilstnegativeandsignificant

Table 5.10 Hierarchical regression analyses on sub models:
Predicting cell phone usage CU

	Gender (β values)		Age (β values)		Education (β values)			
	Male	Female	25 and below	above 25	Grade 10	Grade 12	Degree	Above Degree
N =	1089	210	644	655	216	350	525	208
R² = F =	.724 282**	.524 21.9**	.346 33.5**	.403 43.4**	.465 17.9**	.431 25.7**	.345 27.1**	.875 138**
Age Gender Edu	-.02 - .08**	-.01 - -.02	- .05 -.06	- .04 .13**	-.11* -.10 -	-.05 .09* -	.02 .02 -	.04 .07** -
AL SS NM	-.16** .45** .35**	-.01 .11 .18*	.03 .13** .11**	-.02 .18** .12**	.15 .12 .20*	-.01 .16** .03	-.10* .12* .17**	.17 .65** .19*
AR AS AH FI CS	.07 -.04 -.05 -.03 -.05	-.05 -.24** -.12 -.04 -.20**	-.00 -.21** -.06 -.14** -.11**	-.07 -.18** .02 -.05 -.19**	.03 -.26* -.00 -.33** .00	-.05 -.22** -.08 -.07 -.20**	-.07 -.16** -.01 -.04 -.16**	-.04 .08 -.25 -.30* -.16

** $p < .01$; * $p < .05$; Edu: education; AL: altruism AL; SS: sensation seeking; NM: normlessness NM; AR: attitude (rule obedience); AS: attitude (Speeding); AH: attitude (helmet use); FI: family involvement; CS: commitment to safety

predictors are attitude to speeding AS and commitment to safety CS. That is, educated drivers in the older age band with high sensation seeking SS and normlessness NM are more likely to use cell phone, may be because of their driving skills and overconfidence

that they can manage both activities simultaneously. The common predictors of CU of both age bands are sensation seeking, normlessness, attitude to speeding, and commitment to safety. Influence of sensation seeking and normlessness among the older age band is slightly higher than in the younger age band indicating higher cell phone usage CU among older age band (above 25 years). This result is contradicted by Pöysti, Rajalin and Summala (2005) who observed that young, male drivers more often used their phones while driving than the older drivers and females.

Attitude to speeding AS is high among younger age band and commitment to safety CS is high among the older age band both of which exert influence on cell phone usage. Also, the family involvement influences CU only among younger age band. Attitude to speeding is high among younger age band and commitment to safety is high among the older age band both of which exert influence on cell phone usage. Also, the family involvement FI influences CU only among younger age band. This result indicates that gender, age, altruism AL, attitude to rule obedience AR and attitude to helmet usage AH among younger age band and gender, altruism AL, attitude to rule obedience AR and attitude to helmet usage AH and family involvement FI among older age band failed to predict CU.

In the case of educational groups, among Grade 10 drivers normlessness NM significantly and positively predict CU, while age and family involvement FI significantly predict CU negatively. This means that Grade 10 drivers with normlessness NM are more likely to use cell phone, while older among these drivers with family involvement FI are less likely to use cell phone. Though attitude to speeding AS predicts CU positively, it is not acceptable due to the fact that effect of AS should decrease CU. Among the drivers of Grade 12 educated, gender and sensation seeking

SS positively and significantly predict CU, while attitude to speeding AS and commitment to safety CS significantly predict CU negatively. This reveals that males among Grade 12 drivers with sensation seeking SS are more likely to use cell phone, while drivers of Grade 12 with attitude to speeding AS and commitment to safety CS are less likely to use cell phone CU. Among the degree educated group sensation seeking SS and normlessness NM had positive and significant correlations with CU and altruism AL, attitude to speeding AS and commitment to safety CS had negative and significant correlations with CU. That is the degree educated drivers with higher sensation seeking and normlessness are more likely to use cell phone, while these drivers who score high in altruism, attitude to speeding AS and commitment to safety are less likely to use cell phone. Among the drivers of educated above degree gender, sensation seeking and normlessness significantly and positively predict CU. This shows that males of this group of drivers with higher scores of sensation seeking and normlessness are more likely to use cell phone. Though family involvement predicts CU positively, it is inadmissible due to the fact that FI should predict CU negatively. There is no common predictor of CU among educational groups. But sensation seeking is a common predictor, except Grade 10 drivers and normlessness is a common predictor, except Grade 12. These findings show that CU increases due to the effect of sensation seeking SS and normlessness, which is an interesting finding. Attitude to speeding and commitment to safety are common predictors of CU among Grade 12 and degree educated drivers. Another interesting finding is that CU decreases due to the effect of attitude to speeding and commitment to safety among Grade 12 and degree educated drivers. These findings reveal that, male drivers among educated above degree with high scores of sensation seeking and normlessness are more involved in cell phone usage CU, compared to other groups.

The following variables failed to predict CU: (1) gender, altruism AL, sensation seeking SS, attitude to rule obedience AR, attitude to use helmet AH and commitment to safety CS among Grade 10 drivers (2) age, altruism AL, normlessness NM, attitude to rule obedience AR, attitude to use helmet AH and family involvement FI among Grade 12 drivers (3) age, gender, attitude to rule obedience AR, attitude to use helmet AH and family involvement FI among degree educated drivers and (4) age, altruism AL, all attitudinal variables and family involvement FI and commitment to safety CS among above degree educated drivers.

5.8 DETERMINATION OF PREDICTORS OF NEGLIGENCE OF BIKE EXAMINATIONS NE

5.8.1 Hypotheses (whole model)

The purpose of this part of the study was to examine the effect of all independent variables (gender, age, education level, altruism AL, sensation seeking SS, normlessness NM, attitude to rule obedience AR, attitude to speeding AS, attitude to use helmet AH, family involvement FI and commitment to safety CS) on negligenceof bike examination NE. In order to achieve this, the following hypotheses were advanced.

H5.21: Demography (gender, age and education level) of the driver predicts the negligence of bike examination NE.

H5.22: Personality traits (altruism AL, sensation seeking SS and normlessness NM) of the driver predict the negligence of bike examination NE.

H5.23: Safety attitudes (attitude to rule obedience AR, attitude to speeding AS and attitude to use helmet AH) of the driver predict the negligence of bike examination NE.

H5.24 Family climate for road safety (family involvement FI and commitment to safety CS) of the driver predict the negligence of bike examination NE.

5.8.2 Results and Discussions

5.8.2.1 Regression Model for negligence of bike examination NE

The results of hierarchical multiple regression analysis are presented in Table 5.11. It revealed that at step one, education contributed significantly to the regression model F (3, 1295) = 23.42, p< .001) and accounted for 5.1% of the variation in NE. The personality traits explained an additional 34.2% of variation in NE and this change in R^2 was significant, F (6, 1292) = 139.35, p < .001. Adding attitude variables to the regression model, in step 3 explained an additional 5.3% of the variation in NE and this change in R^2 was also significant, F (9, 1289) = 115.53, p < .001. Finally, in Step 4 the addition of family climate for road safety to the regression model explained an additional 8.7% of the variation in NE and this change in R^2 square was also significant, F (11, 1287) = 133.65, p < .001. The models explained between 5.1% and 53.3% of the variance in NE.

The final step of the hierarchical regression model (Table 5.11) revealed that only gender among demographic variables significantly predict NE negatively. Thus hypothesis H5.21 is partially supported. This result indicates that females are less likely to be negligent of bike examination NE. Though Dandona, Kumar and Dandona (2006) from India have highlighted the poor bike conditions in Hyderabad City, the reasons were not explored. It is also seen from Table 5.11 that altruism AL and sensation seeking SS significantly predict the negligence of bike examination NE. Thus, the hypothesis H5.22 is partially supported. This finding shows that drivers with high scores on sensation seeking SS are more likely to be negligent of motorcycle safety

checks. Attitude towards speeding AS significantly predicts negligence of bike examination NE. Thus, the hypothesis H5.23 is partially supported.

Table 5.11 Hierarchical Regression Analyses:
Predicting negligence of bike examination NE (β values)

Predictors	Step 1	Step 2	Step 3	Step 4
Gender	-.01	-.04	-.05*	-.04*
Age	-.03	.02	.05	-.02
Education	-.23**	-.05*	-.02	.01
Altruism AL		-.39**	-.24**	-.08*
Sensation seeking SS		.24**	.16**	.12**
Normlessness NM		.08**	-.04	-.06
Attitude (traffic flow vs rule obedience) AR			-.11**	-.05
Attitude (speeding) AS			-.16**	-.14**
Attitude (helmet usage) AH			-.20**	-.03
Family involvement FI				-.38**
Commitment to safety CS				-.15**
F	23.42**	139.35**	115.53**	133.65**
Model R^2	.051	.393	.446	.533
R^2 Change	.051	.342	.053	.087

** $p < .01$; * $p < .05$

In the case of family climate for road safety, family involvement FI and commitment to safety CS significantly predict negligenceof bike examination NE. Thus, the hypothesis H5.24 is fully supported. Family involvement is the important predictor of negligence of bike examination NE, which reduces NE considerably. A possible reason for this finding is that drivers from families having road safety awareness consider bike check up before a trip as their duty. NM, AR and AH also failed to predict NE, indicating that these variables have no influence on NE. Thus, the findings can be summarized as: drivers with sensation seeking are more likely to neglect bike examination, while female drivers who score high on altruism, attitude to speeding, family involvement and commitment to safety are less likely to neglect bike examination.

5.8.3 Comparison of results of Regression analysis of negligence of bike examination NE of Sub Groups

Table 5.12 presents the results of hierarchical regression analysis on negligence of bike examination NE among the eight sub models. Results revealed that, age, sensation seeking SS and normlessness NM predict NE significantly and positively, while altruism AL, attitude to speeding AS and family involvement FI predict negligence of bike examination NE negatively in the male model, i.e., young among the male drivers with higher sensation seeking SS and normlessness NM are more likely to be negligent of bike safety check ups, while male drivers who use altruism, attitude to speeding AS and family involvement FI are more likely to do the safety check of the bike. Important predictors of NE in the male model are altruism AL, sensation seeking SS, normlessness NM, attitude to speeding AS and family involvement FI. Influence of sensation seeking SS is high on NE compared to other variables. In the female model, sensation seeking SS and normlessness NM predict NE significantly and positively, while attitude to speeding AS and family involvement FI predict negligence of bike examination NE significantly and negatively. The influence of sensation seeking SS and normlessness NM is higher among males than females, indicating that males are more negligent than females in bike safety checks. Sensation seeking SS, normlessness NM, attitude to speeding AS and family involvement FI are the common predictors among gender models with a high influence of sensation seeking and normlessness among males on NE. From this, it can be concluded that young, male drivers are negligent in the safety checks of bike before a trip. The variables education, AR, AH and CS among males and age, education, AL, AR, AH and CS in the female model failed to predict NE.

	Gender (β values)		Age (β values)		Education (β values)			
	Male	Female	25 and below	above 25	Grade 10	Grade 12	Degree	Above Degree
R² = F =	.752 327**	.514 21.1**	.505 64.7**	.569 85.0**	.757 63.8**	.566 44.3**	.371 30.3**	.844 107**
Age Gender Edu	.07** - .00	.07 - -.00	- -.02 -.01	- -.07** .00	.04 -.01 -	.02 -.08* -	-.01 -.02 -	.04 .00 -
AL SS NM	-.14** .56** .30**	-.07 .15* .19**	-.15** .09* .01	-.01 .15** -.13**	-.04 .13* -.21*	-.19** .07 .00	.02 .16** -.06	.23 .58** .33**
AR AS AH FI CS	.11 -.12** -.02 -.35** -.02	-.02 -.23** -.00 -.45** -.11	-.06 -.10* -.02 -.38** -.11**	-.03 -.16 -.03 -.39** -.21	-.02 -.22** .02 -.55** -.21*	-.09 -.09 -.02 -.36** -.11*	-.07 -.08 -.09 -.34** -.15**	.25 -.09 .25 -.22 -.41**

** p < .01; * p < .05; Edu: education; AL: altruism AL; SS: sensation seeking; NM: normlessness NM; AR: attitude (rule obedience); AS: attitude (Speeding); AH: attitude (helmet use); FI: family involvement; CS: commitment to safety

Table 5.12 also reveal that among younger age model, sensation seeking SS positively and significantly predict NE, while altruism AL, attitude to speeding AS, family involvement FI and commitment to safety CS significantly predict NE negatively. This means that young drivers with high sensation seeking SS are more likely to accept NE, supporting the findings of Chang and Yeh (2007) who found that young riders were more likely to be negligent of motorcycle safety checks. Young drivers with high altruism AL, attitude to speeding AS, family involvement FI and commitment to safety CS are less likely to be negligent of motorcycle safety checks. In the case of the older age drivers, sensation seeking SS significantly predict NE positively implying that they are more likely to be negligent of motorcycle safety checks. Gender and family involvement FI significantly predict NE negatively in the older age band. That is

females possessing high family involvement FI are less likely to be negligent of motorcycle safety checks. Common predictors of NE among age groups are sensation seeking SS and family involvement FI with a high influence of sensation seeking SS on older age band, showing that older drivers with high sensation seeking SS are more involved in NE. Influence of family involvement FI on NE among both age bands is almost the same and emerged as the important predictor reducing NE considerably. Gender, education, NM, AR and AH in the younger age band and education, AL, all attitudinal variables and CS among older age band failed to predict NE.

In the case of educated drivers, Table 5.12 reveals that, sensation seeking SS and normlessness NM positively and significantly predicts NE among Grade 10 drivers, indicating that these drivers are more likely to be negligent of motorcycle safety checks. Attitude to speeding AS, family involvement FI and commitment to safety CS significantly and negatively predict NE among Grade 10 drivers, indicating that drivers having these personal factors are less likely to be negligent of motorcycle safety checks. Gender, altruism AL, family involvement FI and commitment to safety CS significantly and negatively predict NE among Grade 12 drivers, implying that females of Grade 12 drivers possessing AL, FI and CS are less likely to be negligent of motorcycle safety checks. Sensation seeking SS positively and significantly predicts NE among drivers of degree educated implying that these drivers when use SS are more likely to be negligent of motorcycle safety checks. Family involvement FI and commitment to safety CS significantly predict NE negatively among drivers of degree educated implying that these drivers who use high FI and CS are less likely to be negligent of motorcycle safety checks. Among drivers of above degree educated sensation seeking SS and normlessness NM significantly predict NE positively indicating that these

drivers when use SS and NM are more likely to accept NE. Commitment to safety CS significantly and negatively predicts NE among drivers of above degree educated, i.e., drivers of above degree education with commitment to safety CS are less likely to be negligent of motorcycle safety checks. Commitment to safety CS emerged as the common predictor of NE among the drivers of educational groups, with high influence among drivers of above degree educated, reducing NE. Important predictors of NE among Grade 10 drivers are sensation seeking SS, normlessness NM, attitude to speeding AS, family involvement FI and commitment to safety CS. Altruism AL, family involvement FI and commitment to safety CS are prominent predictors of Grade 12 model. Sensation seeking SS, family involvement FI and commitment to safety CS are prominent predictors of degree educated. Sensation seeking SS, normlessness NM and commitment to safety CS are prominent predictors among drivers of above degree educated. Among the educated groups, it is seen that drivers of above degree educated are more negligent of the safety checks, may be due to their overconfidence in the bike condition.

5.9 PRACTICAL IMPLICATIONS

Results of this study highlight the role of sensation seeking and normlessness in developing the risky driving behaviour significantly and strongly among young, male drivers. So, the traits sensation seeking and normlessness of the drivers play an important role in increasing the risky driving on the roads of Kerala. In addition, among female drivers, attitude to rule obedience reduces their risky driving. The family involvement of drivers of different groups is also found to reduce the risky driving. These results could be used to design the pattern of test for learners driving license. The candidates scoring high on sensation seeking SS and normlessness NM and low on

safety attitudes (AR, AS and AH), family involvement (FI) and commitment to safety (CS) may be advised to attend a safety counselling programme, to enhance their safety attitudes (AR, AS and AH) and decrease their sensation seeking SS and normlessness NM before issuing the learners driving license.

5.10 SUMMARY

This chapter has presented the hierarchical regressions used to check the predictors of risky driving behaviour. Results revealed that young, male drivers who possess higher sensation seeking SS and normlessness NM are found more likely to engage in all six types of risky driving behaviour. Female drivers who use altruism AL, safety attitudes to (rule obedience AR, speeding AS and use helmet AH) and family involvement are found less likely to engage in many risky driving behaviour. Older drivers who possess higher safety attitudes are found less likely to engage in many risky driving behaviour. Drivers educated above degree, who use higher sensation seeking and normlessness are found more likely to engage in all six types of risky driving than other groups of educated drivers. Older drivers among Grade 12 and degree educated who possess high altruism and safety attitudes are found less likely to engage in risky driving behavior RA and RS. Degree educated drivers are found more likely to engage in RA, RS, CU and NE next to above degree educated drivers whereas Grade 10 educated drivers are found more likely to engage in RS and DD next to the above degree educated drivers. The following findings of this study are scarce in the literature. (1) normlessness and attitude to rule obedience as predictors of drunken driving (2) personality trait (AL, SS and NM) and family involvement and commitment to safety as predictors of cell phone usage and (3) personality traits, attitudes to safety, family involvement and commitment to safety as predictors of negligence of bike examination.

5.11 CONCLUSIONS

The hierarchical regression analysis revealed that drivers of young, male and highly educated (above degree) who use sensation seeking and normlessness are found more likely to engage in almost all types of risky driving behaviour and can be treated them as "riskier group of drivers". Old aged and female drivers who use high altruism, safety attitudes and family involvement and commitment to safety are found less likely to engage in various types of risky driving behaviour. By enhancing the thoughts of altruism, safety attitudes and family involvement and commitment to safety of the PTW drivers, the risky driving behaviours can be reduced considerably. This can be achieved through safety campaigns and educational programs among the majority of future drivers at the school level and pre-driver safety awareness programs. Also, the safety campaign can be designed to reduce the effects of sensation seeking and normlessness of PTW drivers.

CHAPTER 6

INFLUENCE OF PERSONALITY AND ATTITUDES ON THE RELATIONSHIP BETWEEN AGE/GENDER AND RISKY DRIVING BEHAVIOUR

6.1 INTRODUCTION

The predictive nature of various variables on risky driving behaviour has been investigated in chapter 5. There is an indication that the relationship between age/gender and risky driving behaviour may be influenced by the attitudinal and personality variables. This can be investigated by a statistical method called mediation analysis. Mediation analysis is a crucial methodology in many areas of scientific research. Mediation represents a hypothetical relationship where one variable (independent variable) affects a second variable (mediator variable) and in turn, affects a third variable (dependent variable). The mediator variable explains how an independent variable affects a dependent variable. It is important to understand that mediation is a causal phenomenon, in which the independent predictor variable shapes (imposes a change in) the mediator variable, which in turn imposes a change in the dependent variable. Many authors used meditational analysis to test whether the effect of independent variable (X) on the outcome variable (Y) has been decreased, when the third variable (mediator) is expected to come in between X and Y. In other words, mediation is indicated when a previously significant relationship between the independent variable and dependent variable is substantially reduced when the

mediator variable is entered into the regression equation (Baron and Kenny, 1986). As an example, González-Iglesias et al. (2014) found that peers' norms and self-efficacy mediated the relationship between drivers' sensation seeking and drunken driving significantly, which helped to reduce drunken driving. In another study, Smorti and Guarnieri (2014) observed that adolescent's sensation seeking partially mediates the relationship between parental bond and risky driving among female.

Over the years road safety professionals and researchers have examined young, male driver collisions in order to identify their causes and to develop interventions and campaigns that ultimately aim to reduce their high collision rates. Other than demographic factors, some of the main factors that are considered to be involved in young and male driver crashes are speeding, traffic rule violation, peer influence, driving under the influence of alcohol, cell phone usage and safety checks of bikes.

The literature survey showed that the sub-group of drivers with the "highest accident rates and the highest risky driving on the roads are those in the age group 25 years and below" (Jung, Xiao and Yoon, 2013). Many studies have shown that male drivers were more likely to engage in risky driving behaviours to raise their accident likelihood (Chang and Yeh, 2007). Research has found strong and significant relationship between driver age/gender, safety attitudes in traffic and risky driving (Chen, 2009; Fernandes et al., 2007; Harré et al., 2000). Studies on risky driving suggest that there are significant and positive associations between the personality trait and risky driving (Ullberg and Rundmo, 2003; Chen, 2009). Moreover personality traits are related to the age and gender of the driver (Steinberg et al., 2008; Arnett, 1994; Roth, Schumacher and Brähler, 2005). These facts suggest that the drivers' age/gender, personality traits and risky driving behaviour are all interrelated.

It was seen from the discussions in chapter 4 and 5, that there is significant relationship between age/gender of the driver and risky driving behaviour. When personality and attitudinal variables were entered in the hierarchical regression equation along with age or gender of the driver, the effect of age or gender on risky driving was either diminished or became insignificant. This means that the intervention of attitudinal or personality variables in the relationship of age or gender to risky driving can considerably reduce the effect of age/gender on risky driving. These findings provide a scope to investigate the meditational effect of attitudinal or personality traits in the link between age/gender and risky driving behaviour of the drivers. The primary purpose of this chapter is to assess the usefulness of safety attitudes and personality traits to explain the relationship of age/gender to risky driving of PTW drivers whose age/gender is expected to account for their tendency to involve in risky driving.

6.1.1 Possible Mediators

To the best of our knowledge, the mediating role of attitudinal and personality factors in the link between age/gender of the driver and risky driving has not been examined. Also, it was found that effect of age or gender on risky driving was either diminished or became insignificant, when it was entered with personality and attitudinal variables in the hierarchical regression equation. It is therefore important to better understand the role of driver's safety attitudes and personality traits in the relationship of age/gender and risky driving. Therefore, this study makes an attempt to examine the mediating effect of safety attitudes (attitude to rule obedience and attitude to speeding) and personality traits (altruism, sensation seeking and normlessness) of drivers in the relationship between age/gender and risky driving behaviour among the population under study.

6.2 METHOD

This study was divided into two sections: using the mediators in the relationship between (1) age of driver and risky driving behaviour and (2) gender of driver and risky driving behaviour. Data was taken from the questionnaire survey that was conducted among the PTW drivers in Kerala. In order to conduct mediation analysis, 45 items were used to measure the variables of this part of study. Age of the drivers was categorized into two bands: young drivers (age 25 years and below = 0) and old drivers (age above 25 years = 1). Gender of the drivers was categorized into two (female = 0 and male = 1). For both sections of this study the same risky driving variable as well as same statistical analyses are used.

6.2.1 Formation of Dependent Variable (Risky Driving Behaviour)

Six types of risky driving behaviour were used for hierarchical regression viz., (1) risky driving due to self assertiveness RA (2) risky driving due to speeding RS (3) risky driving due to rule violation RV (4) drunken driving DD (5) cell phone usage CU and (6) negligence of bike examination NE. The summated score of all these risky driving variables (total 24 items) were used in this part of study to form the risky driving behaviour, RD. On examining the reliability of this measure, the 24 items combined together gave a reliability coefficient (Cronbach's alpha) of 0.93.

6.2.2 Data Analysis

According to Baron and Kenny (1986) the procedure of conducting mediation analysis is as follows. A precondition of mediation is that the predictor (X), dependent (Y) and potential mediator variables (M) all have significant bivariate associations. The following steps were conducted to test each mediating model:

(i) Independent variable X (e.g., age/gender) was entered at the first step to determine its association with dependent variable Y (e.g., risky driving; c – path is the coefficient for Y regressed on X)

(ii) Independent variable X was entered at the second step to determine its association with mediator variable M (e.g., sensation seeking; a – path is the coefficient for M regressed on X)

(iii) Mediator M and independent variable X were entered in this order at the third step to determine the association of M with risky driving Y (b – path is the coefficient for Y regressed on M after controlling for X) and

(iv) Independent variable X and mediator variable M were entered in this order at the fourth step (c''- path is the coefficient for Y regressed on X after controlling for M) to find direct effect of X on Y after controlling for M (c' = direct effect).

Mediation exists when a predictor X affects a dependent or criterion variable Y indirectly through one or more mediators M. The simple relationship between X and Y is often referred to as the total effect (the unstandardized regression weight c). The indirect effect of X on Y through M can be quantified as the product of a and b (i.e., a·b). The total effect can be expressed as the combination of direct and indirect effects c = c'+ ab (González-Iglesias, Gómez-Fraguela and Luengo, 2014). Judd and Kenny

(1981) proposed the following tests were necessary to conclude that mediation exists:

1) The effect of X on Y (path c) is significant, 2) The effect of X on M (path a) is significant, 3) The effect of M on Y (path b) controlling for X is significant, and 4) the effect of X on Y (path c') controlling for M is insignificant for full mediation. Baron and Kenny relaxes the fourth condition so that the path c' can have a value different than zero meaning that there can be partial mediation.

The Sobel Z is used to test indirect effect (a*b) by using $Zab = ab/SE(ab)$ where $SE(ab) = \sqrt{(a^2Sb^2 + b^2Sa^2)}$; Sa and Sb are standard errors of a and b. Then, a critical value ($|Zcrit.| = 1.96$ for a two-tailed test) is compared to the Zab statistic to conclude whether the mediated effect, ab is significant (e.g., significant if $Zab > |Zcrit.|$).

6.3 ROLE OF SAFETY ATTITUDES AND PERSONALITY TRAITS AS MEDIATORS BETWEEN AGE OF DRIVER AND RISKY DRIVING RD

6.3.1 Present research and Hypotheses

The purpose of the present research was to analyze: (a) the direct relationship between age and risky driving behaviour RD and (b) the mediating role of the safety attitudes AR and AS and traits altruism AL, sensation seeking SS, and normlessness NM in the relationship between age of the driver and risky driving behaviour RD. To examine this, the following hypotheses were advanced.

H6.1: The attitude to rule obedience AR fully mediates the relationship between the age of PTW driver and risky driving RD.

H6.2: The attitude to speeding AS fully mediates the relationship between the age of PTW driver and risky driving RD.

H6.3: Altruism AL fully mediates the relationship between the age of PTW driver and risky driving RD.

H6.4: Sensation seeking SS fully mediates the relationship between the age of PTW driver and risky driving RD.

H6.5: Normlessness NM fully mediates the relationship between the age of PTW driver and risky driving

6.3.2 Results and Discussion

6.3.2.1 Descriptive Statistics

Table 6.1 shows the Cronbach's Alpha, mean scores and the t test results based on age group (young age and old age) and Cronbach's alpha of the variables used in this study. Younger drivers (aged 25 and below) represented 49.57% of the sample and older drivers (aged above 25) 50.43%.

Table 6.1 Comparison of mean of study variables: Results of independent t test based on age and Cronbach's Alpha

Factor	Cronbach's Alpha (α)	Mean (SD)			No. of Items	t value
		Age < 26 N = 644	Age > 25 N = 655	Total N = 1299		
AR	0.76	2.74 (0.86)	2.88 (1.04)	2.81 (0.96)	5	-2.81**
AS	0.70	2.90 (0.94)	3.04 (1.08)	2.97 (1.01)	4	-2.36*
AL	0.81	3.63 (0.92)	3.56 (1.02)	3.59 (0.97)	4	1.40
SS	0.67	3.12 (0.88)	2.96 (0.99)	3.04 (0.94)	4	2.88**
NM	0.72	2.97 (0.90)	2.94 (1.05)	2.95 (0.98)	4	0.58
RD	0.93	2.51 (0.78)	2.41 (0.89)	2.46 (0.84)	24	2.30*

$*p < .05$; $**p < .01$; AR: attitude to traffic flow vs rule obedience; AS: attitude to speeding; AL: altruism; SS: sensation seeking; NM: normlessness; RD: risky driving.

Result shows that, there is significant difference in safety attitudes AR, AS and sensation seeking SS and there is no significant difference in the traits of altruism and normlessness on the basis of age. Scores of safety attitudes AR, AS of young drivers are lower than that of old age, while scores of sensation seeking SS and risky driving RD of young drivers are higher than those of the old drivers.

6.3.2.2 Correlation Analysis

To test the precondition of mediation analysis, a correlation analysis is conducted between the predictor (X), dependent (Y) and potential mediating variable (M) and the result is presented in Table 6.2. Results showed significant positive associations between the age of the driver and safety attitudes AR and AS. Results also showed significant negative associations of age of the driver with sensation seeking and risky driving RD. However, altruism AL and normlessness NM are not significantly correlated to the age group.

Table 6.2 Correlations of Study Variables with Age Group

Factor	AR	AS	AL	SS	NM	RD
Age Group	.08**	.07*	-.04	-.08**	-.01	-.06*
RD	-.63**	-.68**	-.72**	.69**	.71**	-

*p < .05; **p < .01; AR: attitude to traffic flow vs rule obedience; AS: attitude to speeding; AL: altruism; SS: sensation seeking; NM: normlessness; RD: risky driving.

Therefore it is proposed to examine the mediating role of only safety attitudes AR and AS and sensation seeking SS in the link between age of driver and risky driving RD.The attitude to rule obedience AR and attitude to speeding AS are significantly correlated negatively with risky driving, indicating that drivers with low safety attitudes are more likely to engage in risky driving. Sensation seeking is significantly and positively correlated with risky driving, indicating that high sensation seekers are prone to risky driving. Therefore, the data is found to satisfy the basic requirements for mediation analysis.

6.3.2.3 Mediation Analyses

The meditational relationship between age of the driver, safety attitudes AR and AS and sensation seeking SS and risky driving RD were examined, in accordance to

Baron and Kenny (1986) approach at two levels. The results revealed (Table 6.3) that, direct effects (c') are insignificant and have a strong mediation effect in the link between age and risky driving behaviour. The results computed from indirect effects (a*b) also show that there is indeed a mediation effect on this relationship. These two results clearly indicate that the association between the age of the driver and risky driving is fully mediated by safety attitudes AR and AS and sensation seeking SS. The Sobel Z is used to test indirect effect (a*b) and found that mediation is significant.

The association between age of the driver and risky driving was fully mediated by the safety attitude AR. The unstandardized regression coefficient between age and AR was statistically significant ($R^2 = 0.01$, a = .15, p < .01), as was the unstandardized regression coefficient between attitude AR and risky driving ($R^2 = 0.393$, b = -.53, p < .001). When risky driving was regressed on attitude AR and age of the driver the latter's effect was reduced to nearly zero. Approximately 39% of the variance in risky driving was accounted for by the predictors (R^2 = .393). Also, the association between age of the driver and risky driving was fully mediated by the safety attitude AS. The unstandardized regression coefficient between age and AS was statistically significant ($R^2 = 0.01$, a = .13, p < .05), as was the unstandardized regression coefficient between attitude AS and risky driving ($R^2 = 0.470$, b = -.55, p < .001). When risky driving RD was regressed on attitude AS and age of the driver the latter's effect was reduced to nearly zero. Approximately 47% of the variance in risky driving was accounted for by the predictors (R^2 = .470).

The association between the age of the driver and risky driving was fully mediated by sensation seeking SS. The unstandardized regression coefficient between age and

sensation seeking was statistically significant (R^2 = 0.01, a = -.15, p < .01), as was the unstandardized regression coefficient between sensation seeking and risky driving (R^2 = 0.471, b = .60, p < .001).When risky driving was regressed on sensation seeking and on the age of the driver, the latter's effect was reduced to nearly zero. Approximately 47% of the variance in risky driving was accounted for by the predictors (R^2 = .471).

Table 6.3 Results of mediation analyses (Independent variable: age)

M	a	b	c	c'	a.b	Sa	Sb	Sobel Z
AR	.15 0**	-.53 4**	-.105 *	-.025	-.080	.053	.018	2.82 **
AS	.13 3*	-.554**		-.031	-.074	.056	.016	2.37*
SS	-.150**	.597**		-.015	-.09	.052	.018	2.87**

**p < .01; * p < .05; M: Mediator; AR: attitude to rule obedience; AS: attitude to speeding; SS: sensation seeking; RD: risky driving (dependent variable); a-path is the coefficient for M regressed on age; b-path is the coefficient for RD regressed on M after controlling for age; c-path is the coefficient for RD regressed on age; c''-path is the coefficient for RD regressed on age after controlling for M; Sa and Sb: standard error.

The results of mediation analysis revealed a direct link between the age of the driver and risky driving, before taking the mediator into account in the regression which are consistent with those of other studies (Lin et al., 2003; Keall and Newstead, 2012; Hassan and Abdel-Aty, 2013). When driver's safety attitude AR and AS and sensation seeking SS were included in the relationship between the age of the driver and risky driving, it fully mediated this link. Thus, the hypotheses H6.1, H6.2 and H6.4 are fully supported. Since the mediators, altruism and normlessness failed to correlate with age band of the driver, no mediation was supported in the relationship between the age of the driver and risky driving. Thus, the hypotheses H6.3 and H6.5 were not supported and hence rejected. The finding that risky driving is influenced by safety attitudes and sensation seeking are consistent with earlier studies (Jonah, 1997; Ulleberg and Rundmo, 2003; Chen, 2009; Iversen, 2004).

When safety attitudes AR and AS were included in the relationship between the age of the driver and risky driving in the regression equation, the association of age of the

driver and risky driving was found statistically insignificant. That is, age of the driver predicts risky driving only to the extent that it accompanies safety attitude in traffic resulting in no independent association with risky driving, after the relationships between safety attitude and risky driving are statistically controlled. Thus, age of the drivers may exert an indirect influence on risky driving through safety attitudes in traffic, which in turn predicts the drivers` risky driving. In other words, with the entry of safety attitudes as mediators in the link between age and risky driving the effect of age on risky driving becomes insignificant.

When driver`s sensation seeking was included in the relationship between the age of the driver and risky driving, it fully mediated this relationship. More specifically, age of the driver predicts risky driving only to the extent that it accompanies sensation seeking resulting in no independent association with risky driving, after the relationships between sensation seeking and risky driving are statistically controlled. In other words, with the entry of sensation seeking as mediator in the link between age and risky driving the effect of age on risky driving diminishes. Thus, age of the drivers exerts an indirect influence on risky driving through sensation seeking. So, the instruments such as safety education in the adolescence stage to reduce the sensation seeking among young drivers appear to be a significant protective factor for the development of positive attitudes to the reduction of sensation seeking, resulting in low risky driving.

The mediation analyses clearly demonstrate the mechanism with which age of the driver influences risky driving behaviour through the mediators. This means that by

improving safety attitudes and decreasing sensation seeking of young drivers, the risky driving behaviour can be reduced to a great extent. These results support the findings of Hassan and Abdel-Aty (2013) who observed that "providing young drivers with better education and awareness programs about safe driving" were the best possible actions or procedures to improve safety of young. Arnett, Offers and Fine (1997) found that shaping of personality traits (e.g., sensation seeking) may be possible by driver education so that it addresses directly to adolescents propensities for that trait. Therefore, this study suggests that the meditational models can help us to predict PTW drivers risky driving behaviour and increase our understanding why younger drivers involve in higher level of risky driving and violate traffic rules while older one's don't.

6.4 ROLE OF SAFETY ATTITUDES AND PERSONALITY TRAITS AS MEDIATORS BETWEEN GENDER OF DRIVER AND RISKY DRIVING

It is known that age/gender of the driver are associated with safety attitude, personality traits and risky driving. Chen (2009) observed that male's risky driving behaviour is significantly higher than that of a female. Younger and male drivers express a lower level of safety attitude to comply with traffic rules than do female and older drivers (Yagil, 1998). These facts indicate a inter relationship between gender, safety attitude and risky driving. Rushton et al. (1986) found that women had higher scores than men on altruism AL. This seems to suggest that there exists a link between the drivers' gender, altruism and risky driving.

Gender differences have been found in the trait sensation seeking SS; males recording higher scores than females (Jonah, 1997; Arnett, 1994). Sensation seekers were more involved in risky driving and resultant accidents which suggest that sensation seekers do not only drive faster and commit more traffic-rule violations but also be more involved in traffic accidents than others (Iversen and Rundmo, 2002). Sensation seeking

influences risky driving directly and moderates the driver's response to other factors such as alcohol impairment and perceived risk (Jonah, 1997). This seems to suggest that there exists a link between the drivers' gender, sensation seeking, and risky driving. Individuals who have high scores on normlessness are likely to have low barriers towards anti-social behaviours, and this is reflected in risk-taking attitudes towards rule violation (Chen, 2009). Many studies found significant differences between male and female respondents in normlessness, that is, males scored higher values than the females (Chen, 2009; Oltedal and Rundmo, 2006; Neal, 1959). These facts seem to indicate that there exists a link between gender, normlessness and risky driving. It is therefore important to better understand the role of altruism, sensation seeking, normlessness in the relationship of gender and risky driving.

This study therefore tries to examine the role of attitude to rule obedience AR and attitude to speeding AS and personality traits viz., altruism AL, sensation seeking SS and normlessness NM, in the relationship between gender of driver and risky driving by conducting a series of mediation analyses.

6.4.1 Present research and Hypotheses

The purpose of the present research was to examine the mediating role of the safety attitudes AR and AS and altruism AL, sensation seeking SS, and normlessness NM in the relationship between gender of the driver and risky driving. To investigate this, the following hypotheses were advanced.

H6.6: Attitude to rule obedience AR fully mediates the relationship between the gender of PTW driver and risky driving RD.

H6.7: Attitude to speeding AS fully mediates the relationship between the gender of PTW driver and risky driving RD.

H6.8: Altruism AL fully mediates the relationship between the gender of PTW driver and risky driving RD.

H6.9: Sensation seeking SS fully mediates the relationship between the gender of PTW driver and risky driving RD.

H6.10: Normlessness NM fully mediates the relationship between the gender of PTW driver and risky driving RD.

6.4.2 Results and Discussion

6.4.2.1 Descriptive Statistics

Table 6.4 shows the Cronbach's Alpha, mean scores and the t test results based on gender of the variables used in this study. Male drivers represented 83.83% of the sample and female drivers 16.17%.

Table 6.4 Comparison of mean of study variables: Results of t-test based on gender and Cronbach's Alpha

| Factor | Cronbach's Alpha (α) | Mean (SD) | | | No. of Items | t value |
		Male N = 1089	Female N = 210	Total N = 1299		
AR	0.76	2.77(0.97)	3.02(0.87)	2.81(0.96)	5	-3.50**
AS	0.70	2.94(1.02)	3.17(0.97)	2.97(1.02)	4	-3.19**
AL	0.81	3.56(0.98)	3.78(0.90)	3.60(0.97)	4	-3.24**
SS	0.67	3.07(0.95)	2.89(0.90)	3.04(0.94)	4	2.66**
NM	0.72	2.99(0.99)	2.75(0.91)	2.95(0.98)	4	3.39**
RD	0.93	2.50(0.86)	2.24(0.72)	2.46(0.84)	24	4.40**

*p< .05; **p< .01; AR: attitude to rule obedience; AS: attitude to speeding; AL: altruism; SS: sensation seeking; NM: normlessness; RD: risky driving.

The safety attitudes AR and AS and altruism AL were found to be higher for female drivers compared to male drivers. However, scores of sensation seeking SS, normlessness NM and risky driving (RD) were found to be higher for male drivers compared to female drivers. All study variables have significant differences on the basis of gender.

6.4.2.2 Correlation Analysis

A precondition of mediation analysis is that the predictor (X), dependent (Y) and potential mediator variables (M) all have significant bivariate associations. Therefore, correlation analysis is conducted and presented in Table 6.5. Results showed significant negative associations between the gender of the driver and safety attitudes AR, AS and altruism AL and positive associations between sensation seeking SS, normlessness NM and risky driving RD, indicating lesser safety attitudes and altruism AL and higher levels of SS, NM and RD among male PTW drivers. Correlation results also show that all the suspected mediators are significantly and strongly correlated to the risky driving RD, satisfying the basic requirement of mediation analyses.

Table 6.5 Correlations of the study variables with Gender

Factor	Gender	AR	AS	AL	SS	NM
Gender	-	-.10**	-.09**	-.09**	0.07*	0.09**
RD	0.11**	-.63**	-.68**	-.72**	0.69**	0.71**

*$p < .05$; **$p < .01$; AR: attitude to rule obedience; AS: attitude to speeding; AL: altruism; SS: sensation seeking; NM: normlessness; RD: risky driving.

6.4.2.3 Mediation Analyses

The meditational role of the safety attitudes AR and AS and altruism AL, sensation seeking SS, normlessness NM in the relationships between gender of the driver and risky driving was examined and is presented in Table 6.6. The mediation analyses

revealed that gender of the driver positively predicted sensation seeking SS and normlessness NM and risky driving and negatively predicted altruism AL and safety attitudes AR and AS. Table 6.6 also reveals that when mediators safety attitudes AR, AS and traits AL, SS and NM were included in the relationships between gender of the driver and risky driving, the direct effect (c') was significant but the effect of gender on risky driving is considerably reduced. The results computed from indirect effects (a*b) show that there is a mediation effect on this relationship, since the difference of total effect and direct effect (c-c') = indirect effect (a*b). These indicate that there exists a partial mediation when mediators AR and AS and traits AL, SS and NM were included in the relationships between gender of the driver and risky driving in accordance to Baron and Kenny (1986). Thus, hypotheses H6.6 to H6.10 are partially supported. The Sobel Z is used to test indirect effect (a*b) and found that mediation is significant.

The unstandardized regression coefficient between gender and attitude AR was statistically significant ($R^2 = 0.02$, a = -.25, p < .001), as was the unstandardized regression coefficient between attitude AR and risky driving ($R^2 = 0.397$, $\beta = -.53$, p < .001). When risky driving RD was regressed on attitude AR and on the gender of the driver the latter's effect on RD was reduced by 49.6%. Approximately 40% of the variance in risky driving was accounted for by the predictors ($R^2 = .397$).

The association between the gender of the driver and risky driving was partially mediated by attitude scale AS. The unstandardized regression coefficient between gender and attitude AS was statistically significant ($R^2 = 0.02$, a = -.24, p < .01), as was the unstandardized regression coefficient between attitude AS and risky driving ($R^2 = 0.474$, b = -.55, p < .001). When risky driving RD was regressed on attitude AS

and on the gender of the driver the latter's effect was reduced by 48.1%. Approximately 47% of the variance in risky driving was accounted for by the predictors (R^2 = .474). The association between the gender of the driver and risky driving was partially mediated by altruism AL. The unstandardized regression coefficient between gender and AL was statistically significant (R^2 = 0.01, a = -.22, p < .01), as was the unstandardized regression coefficient between altruism and risky driving (R^2 = 0.507, b = -.60, p < .001). When risky driving (RD) was regressed on AL and on the gender of the driver the latter's effect on RD was reduced by 50.7%. Approximately 51% of the variance in risky driving was accounted for by the predictors (R^2 = .507).

Table 6.6 Results of mediation analyses (Independent variable: gender)

M	a	b	c	c'	a.b	Sa	Sb	Sobel Z
AR	-.253**	-.530**	.270**	.136**	.134	.072	.018	3.489**
AS	-.237**	-.554**		.140**	.130	.076	.016	3.144**
AL	-.224**	-.598**		.137**	.133	.073	.017	3.002**
SS	.182*	.598**		.162**	.108	.071	.018	2.528*
NM	.237**	.590**		.131**	.139	.074	.016	3.230**

**p < .01; * p < .05; M: Mediator; AR: attitude to rule obedience; AS: attitude to speeding; AL: altruism; SS: sensation seeking; NM: normlessness; RD: risky driving (dependent variable); a-path is the coefficient for M regressed on gender; b-path is the coefficient for RD regressed on M after controlling for gender; c-path is the coefficient for RD regressed on gender; c''-path is the coefficient for RD regressed on gender after controlling for M; Sa and Sb: standard error.

The association between the gender of the driver and risky driving was partially mediated by sensation seeking SS. The unstandardized regression coefficient between gender and SS was statistically significant (R^2 = 0.02, a = .18, p < .01), as was the unstandardized regression coefficient between SS and risky driving RD (R^2 = 0.476, b = .60, p < .001). When risky driving was regressed on SS and on the gender of the driver the latter's effect was reduced by 40%. Approximately 48% of the variance in

risky driving was accounted for by the predictors (R^2 = .476). The association between the gender of the driver and risky driving RD was partially mediated by normlessness NM. The unstandardized regression coefficient between gender and NM was statistically significant (R^2 = 0.01, a = .24, p < .001), as was the unstandardized regression coefficient between NM and risky driving (R^2 = 0.504, b = .60, p < .001). When risky driving was regressed on NM and on the gender of the driver the latter's effect was reduced by 51.5%. Approximately 50% of the variance in risky driving was accounted for by the predictors (R^2 = .504).

The results revealed a direct link between the gender of the driver and risky driving, before taking mediators into account in the regression equation. These results are consistent with those of other studies (Lin et al., 2003; Chen, 2009; Chang and Yeh, 2007). When mediator variable was included in the regression equation it partially mediated the link between gender and risky driving. More specifically, when mediator comes between gender and risky driving, in the regression equation, it decreases the effect of gender on risky driving. For example, male drivers are highly involved in risky driving, because they score high in sensation seeking and normlessness. Thus, gender of the drivers may exert an indirect influence on risky driving by shaping/reducing their sensation seeking and/or normlessness which in turn predicts the drivers` risky driving.

When safety attitudes AR and AS were introduced as mediators, a statistically significant reduction in the association of gender of the driver and risky driving was found. Thus, gender of the drivers may exert an indirect influence on risky driving by enhancing their safety attitude in traffic, which in turn predicts the drivers` risky driving. In other words, with the entry of safety attitude as mediator in the link

between gender and risky driving the effect of gender on risky driving reduced significantly by shaping (enhancing) the safety attitude of the driver. Generally, male drivers are more inclined towards risky driving in the traffic. One possible explanation is that male drivers in general, perceive themselves as very skilled and believe that even if they disregard the traffic rules, they would still be able to master the PTW and avoid a crash. Another reason is that rule violation might have been carried out over a length of time without encountering any negative consequences due to favourable traffic conditions. By enhancing the safety attitudes of AR and AS of males (7.5% and 6.7% respectively, lower than those in females), their involvement in risky driving can be effectively reduced approximately by 52% and 46% respectively. In other words, scores of safety attitude AR and AS of female drivers are higher than in males, possibly because women believe more than men that traffic laws should always be obeyed regardless of their evaluation of the situation and are more willing to accept the legitimacy of the law and to abdicate personal decision-making as to the appropriate behaviour in a certain situation. For e.g., women are less likely than men to exceed the speed limit, even if they are convinced that it would be safe to do so.

When altruism was used as the mediator in the link between gender and risky driving, partial mediation was fulfilled, indicating a considerable reduction in the effect of gender on risky driving. Moreover, individuals with a high score in this variable tend to respect and help other road users and show negative attitudes towards risky driving. Further, female drivers scoring high on altruism were more likely to have a positive attitude towards traffic safety and were less likely to report risky driving in traffic. A possible explanation is that individuals scoring high on altruism are expected to show active concern for others in traffic and thus reflect itself in less risky driving in traffic

(Ulleberg and Rundmo, 2003; Chen, 2009). Thus, this study found that drivers' gender exert an indirect influence on risky driving by instigating their altruism. This trait among female drivers helps to bring traffic safety on the roads.

When driver`s sensation seeking was included in the relationship between the gender of the driver and risky driving RD, it partially mediated this link. In other words, with the entry of sensation seeking as mediator in the link between age and risky driving the effect of gender on risky driving reduces considerably. Thus, gender of the drivers exerts an indirect influence on risky driving through sensation seeking. A plausible explanation for this is that sensation-seekers are expected to seek excitement and stimulation in traffic, which is reflected in risky driving (Ulleberg and Rundmo, 2003). So the instruments such as safety education in the adolescence stage to reduce sensation seeking among male drivers appear to be a significant protective factor for the development of positive attitudes such as reduction of sensation seeking, resulting in low risky driving.

Individuals scoring high on normlessness are assumed to have low barriers towards socially unapproved behaviour. This may mirror itself in traffic situations, where normless individuals can be expected to show low barriers towards rule violation in traffic (Ulleberg and Rundmo, 2003; Chen, 2009). When normlessness was used as the mediator in the link between gender and risky driving, partial mediation was supported, indicating a considerable reduction in the effect of gender on risky driving, i.e., drivers exerted an indirect influence on risky driving by subduing their normlessness. It is quite reasonable to believe that, risky driving of male drivers could be reduced by lowering their inclination towards sensation seeking and normlessness.

The results of this study are consistent with earlier findings that male drivers express a lower level of safety attitude to comply with traffic laws (Md Nor and Abdullah, 2014; Yagil, 1998) and a higher level of sensation seeking and normlessness (Chen, 2009). Moreover, the influence of peer pressure on male drivers" risky driving behaviour is evident. Male drivers" attitude to drive fast, follow too closely a car in front (Parker et al., 1992), break traffic rules (Rutter and Quine, 1996), drive after drinking and use cell phones while driving (Pöysti et al., 2005) were also higher than in females. Therefore, this study suggests that the meditational models can help us to predict PTW drivers" risky and unsafe driving behaviour and increase our understanding why male drivers observe higher level of risky driving and violate traffic rules than females do.

6.5 PRACTICAL IMPLICATIONS

The implication of this result is that the PTW riders with low scores of safety attitudes and high scores of sensation seeking and normlessness engage in risky driving behaviour. In other words, the practical implication of the results of meditational models would be to acknowledge its importance in traffic safety campaigns. Yagil (1998) found that male young drivers express a lower level of safety attitude to comply with traffic laws than do female and older drivers. The drivers' attitudes about safety are formed at an early age and hence, more education programs or campaigns for young drivers may help in reducing their crash risk (Hassan and Abdel-Aty, 2013). A change in attitude is one of the important ways of reducing or preventing the number of traffic accidents (Muzikante and Reņģe, 2011). Further, according to Chen (2009) more delicate strategies in association with drivers' personality traits for both sexes are supposed to be effective for changing drivers' attitudes to traffic safety and further reduce their future risk-taking behaviours. Mann and Lansdown (2009) found that a change in safety attitude is feasible among adolescents by making them answer two sets

of questionnaires consisting of risk-taking attitude, risky behaviour including drunken driving and use of cell phone while driving, first before a pre-driver awareness campaign and the second one after a lapse of 6 months. In a similar study, Falk (2010) found a significant decrease in self reported risky driving behaviour after answering two sets of questionnaires regarding self reported risky driving behaviour and attitudes during five weeks' time. Moreover, drivers cannot be expected to change their attitude towards road safety as long as they do not perceive the majority of other road users too are not in favour of it (De Pelsmacker and Janssens, 2007). Therefore, safety campaigns and educational programmes should be implemented among the majority of future drivers at the school level and pre-driver safety awareness programmes targeted to implant the positive attitude to traffic safety.

Although personality traits have been found to be relatively stable across time, and there is also evidence for their having a biological basis (Loehlin, 1992), shaping of personality traits (e.g., sensation seeking) may be possible by driver education so that it addresses directly to adolescents propensities for that trait (Arnett, Offers and Fine, 1997). Direct intervention to change the personality traits (sensation seeking) of the drivers would not bring the desired effect. Instead messages with a high sensation value or norms approved by society, having ability to elicit sensory, affective and arousal response in traffic safety campaigns, which are more efficient and appealing to high sensation-seekers or normless drivers could be used (Ulleberg and Rundmo, 2003; Palmgreen et al., 1991- cited in Green et al., 2000). The mindset of the sensation seekers could be diverted from risky driving by creating awareness that sensation seeking is most fit for firefighting, mountain rescue, and mine rescue

squads and sports (Roberti, 2004) and not for PTW drivers. Also, the mindset of the normless drivers could be diverted from risky driving by creating awareness that individuals scoring high in normlessness lose the sense of what is right and wrong.

In addition, mediating role of safety attitudes and personality traits in reducing the risky driving of young, male drivers could be helpful in the education and training of both novice and experienced drivers, as it may arouse their self-awareness on how their safety attitudes and personality traits could have potential effects on the consequences of their behaviours in driving (Tao et al., 2017). Unlike sensation seeking and normlessness, altruism could be shaped (enhanced) by arousing one's natural capacities and tendencies toward compassionate love and a desire to ease others" suffering.

Therefore, school curriculum and safety campaign may be designed by including the outcome of altruism, sensation seeking and normlessness to implant road safety awareness among the adolescents, particularly among novice and young drivers. Moreover, these results suggest that interventions need to target the young, male drivers (age 25 and below) to enhance their safety attitude and altruism in traffic as well as to pull down their propensity to sensation seeking and normlessness.

6.6 SUMMARY

The highlight of this chapter is the development of mediation model connecting age/gender and risky driving behaviour of PTW drivers. Even though the role of age and gender on risky driving behaviour of PTW drivers have been studied in the various parts of the world, the mediating role of safety attitudes and personality traits of drivers on this relationship have seldom been analyzed. This is novelty part of this study.

6.6.1 Mediation in the relationship between drivers' age and risky driving

This study accepted the following hypotheses that: H6.1: The attitude to rule obedience AR fully mediates the relationship between the age of PTW driver and risky driving RD; H6.2: The attitude to speeding AS fully mediates the relationship between the age of PTW driver and risky driving RD; H6.4: Sensation seeking SS fully mediates the relationship between the age of PTW driver and risky driving RD. This study rejected the following hypotheses that: H6.3: Altruism AL fully mediates the relationship between the age of PTW driver and risky driving RD and H6.5: Normlessness NM fully mediates the relationship between the age of PTW driver and risky driving.

6.6.2 Mediation in the relationship between drivers' gender and risky driving

This study partially accepted the following hypotheses that: H6.6: Attitude to rule obedience AR fully mediates the relationship between the gender of PTW driver and risky driving RD; H6.7: Attitude to speeding AS fully mediates the relationship between the gender of PTW driver and risky driving RD; H6.8: Altruism AL fully mediates the relationship between the gender of PTW driver and risky driving RD; H6.9: Sensation seeking SS fully mediates the relationship between the gender of PTW driver and risky driving RD and H6.10: Normlessness NM fully mediates the relationship between the gender of PTW driver and risky driving RD.

6.7 CONCLUSIONS

Mediation analyses were conducted to investigate the role of attitude to rule obedience AR and attitude to speeding AS and personality traits of altruism AL, sensation seeking SS and normlessness NM as mediators in the relationship between drivers' age or

gender and risky driving RD. Mediation was fully supported when attitude to rule obedience AR and attitude to speeding AS and sensation seeking SS were included in the relationship between the age of the driver and risky driving. By enhancing safety attitudes AR and AS and decreasing sensation seeking among young PTW drivers (through safety education and campaigns), effect of the age of the driver on risky driving could be reduced. Mediation was partially supported when the mediators, attitude to rule obedience AR and attitude to speeding AS and altruism AL, sensation seeking SS and normlessness NM were included in the relationship between the gender of the driver and risky driving. By enhancing safety attitudes and altruism, and decreasing sensation seeking and normlessness among male PTW drivers (through safety education and campaigns), effect of the gender of the driver on risky driving could be reduced.

CHAPTER SEVEN

SUMMARY AND CONCLUSIONS

7.1 INTRODUCTION

Road safety is a major issue to all road users as well as road safety managers. Powered two wheelers are inherently unstable and are vulnerable to accidents due to various reasons including road and driving conditions. But all other conditions remaining the same for all drivers, risky driving behaviour of PTW drivers is an important contributor to road crashes. Despite significant road safety initiatives in Kerala during recent years, the burden of road traffic crashes (RTC) continues to worsen disproportionally affecting the Powered Two Wheeler (PTW) drivers' life, money, time and energy. A major barrier to improving road safety in Kerala is the lack of accurate and reliable data to quantify and characterize RTC for the design, implementation, and evaluation of road safety interventions. India being a developing country, holding second position in population of the world, collecting and keeping reliable road accident and crash records does not match with those done in developed countries. Therefore, existing police, hospital, death registration, and survey data in Kerala are currently inadequate for RTC studies and surveillance. Hence, despite the issue of biases, it is necessary to collect self reported responses from PTW drivers to analyze the factors that influence road accidents and crashes involving them. This research identified risky driving behaviour of PTW drivers as the major contributor to road crashes and analyzed the influence of demographic, personal, attitudinal and family related variables and their inter-relationships with risky driving behaviour

with the help of data collected from PTW drivers in the state of Kerala. This chapter gives the summary of the contributions of the research work, limitations of this study, scope for future work in the present research scenario and conclusions of the thesis.

7.2 RESEARCH CONTRIBUTIONS

The contributions of the research are summarized as follows.

1. Identified risky driving behaviour of PTW drivers as the major contributor towards road crashes involving PTWs.

2. Identified six types of risky driving behaviours which are most relevant to the PTW drivers of Kerala that have the potential to cause road crashes.

3. Identified eleven independent variables viz., three demographic variables, three safety attitudes, three personality traits and two factors of family climate for road safety that influence risky driving behaviour.

4. Developed an instrument to measure the levels of all six types of risky driving behaviour and influencing variables from PTW drivers and the instrument was validated through extensive empirical tests for validity and reliability.

5. Influence of demographic variables on all six types of risky driving behaviour and variables of attitudinal and family climate for road safety of PTW drivers were investigated.

6. Young, male and less educated drivers were found to possess higher levels of all the six risky driving behaviour.

7. Female PTW drivers of Kerala were found to possess higher level of safety attitudes including helmet usage and family involvement than male drivers.

8. Significant differences were found on safety attitudes and family climate for road safety among drivers grouped on the basis of education, and the highest score was noticed among drivers with degree and above degree education and the lowest among drivers with Grade 10 education.

9. Well educated drivers (degree and above) were found to have similar levels of road safety attitudes and family climate for road safety except for attitude to rule obedience.

10. All the six risky driving behavior measures decreases with increase in level of education of the drivers.

11. The mean scores of all the attitudinal and family climate for road safety measures improve with education.

12. Developed regression models to predict all the six risky driving behaviour of PTW drivers.

13. Sensation seeking and normlessness were found to predict most of the risky driving behaviour among young, males and also among drivers who possess higher levels of education.

14. Among female drivers' altruism, safety attitudes and family involvement were found to predict (negative influence) all the six risky driving behaviour.

15. Personality traits and attitudes to safety were found to predict negligence of vehicle examination which is a measure of risky driving behaviour. This finding adds to the not-so-rich research literature in this field.

16. Normlessness and attitude to rule obedience were found to predict drunken driving which is a measure of risky driving behaviour. This finding is a novel one and adds to the research literature in this field.

17. Personality traits and family climate for road safety were found to predict cell phone usage of PTW drivers which is a measure of risky driving behaviour. This finding also is a novel one and adds to the research literature in this field.

18. Drivers' attitude to speeding, attitude to rule obedience and sensation seeking were individually found to fully mediate the relationship between age of the driver and risky driving behaviour. This finding adds to the not-so-rich research literature in this field. This finding can help authorities to focus intervention strategies to reduce risky driving behaviour of drivers.

19. Drivers' attitude to speeding, attitude to rule obedience, sensation seeking, normlessness and altruism were individually found to partially mediate the relationship between gender of the driver and risky driving behaviour. This finding also adds to the not-so-rich research literature in this field. This finding can guide authorities to plan intervention strategies to reduce risky driving behaviour of the PTW drivers.

7.3 LIMITATIONS OF THE PRESENT WORK

As mentioned earlier, much work has not been done in this area in India. Hence, this research design had to be based mainly on work reported internationally. However, discussions with road safety professionals were used to modify the research design to suit the Indian environment. India being a multi-cultural country, it was thought appropriate to study the situation in a single cultural segment. This segment was chosen as the state of Kerala for reasons of familiarity of the researcher with the culture and conditions.

However, this study also has a few limitations and they are presented below:

1. This research was based on a cross sectional study and all the study variables were measured at the same time which might have affected the causal link between the influencing variables and dependent variable due to the measurement biases. The argument is that the respondents give answers to justify their previous answers/actions. An alternate method is the longitudinal study which in this case was difficult due to the random selection of the respondents. It is seen that most of the researches in the area of road safety are based on cross sectional study only.

2. The scales used to measure cell phone usage and sensation seeking has low reliability of 0.66 and 0.67 respectively. The lowest acceptable value for Cronbach's alpha is 0.70, below which internal consistency in a scale is deemed poor. However alpha value of 0.6 or above is usually acceptable in social science research.

3. Female population in our study (N = 210) is low compared to male population (N = 1089), and the same is the case on the roads of Kerala.

Despite the above limitations of the study, with proper use of statistical tools and rigour of research methodology adopted, this research has been able to make considerable contributions.

7.4 SCOPE FOR FUTURE WORK

The variables selected for the study were decided after rigorous literature review and discussions with PTW drivers, motor vehicle department officials and road safety authorities. However, studies with a few more variables such as driving experience in years and average distance travelled in a day can be attempted to examine their effect on risky driving behaviour.

The finding of this study that young, male drivers with less educational background exhibit risky driving behaviour on the road clearly indicate a gap for future research to concentrate on this group. Moreover, a longitudinal study with measurement of dependent and influencing variables from the same respondents during two different timings (in a gap of three to six months) can be attempted to minimize measurement errors.

7.5 CONCLUSIONS OF THE THESIS

Attempting to do a work in the area of risky driving behaviour of PTW driver in India posed a challenge. Identifying the objectives of the research, when not enough published material is available, was the first challenge. This was overcome by the use

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of international literature survey and logical extension of the research findings to understand the problem area and lay down objectives of the research. Design of the tool for data collection posed some challenge since the factors to be proved and questions to be asked to elicit response had to be appropriate for the respondents. This study has established the importance of understanding the factors that influence risky driving behaviour of PTW drivers so as to enable the road safety managers to improve the safety of all road users. Details of the analysis and findings presented earlier in this thesis will be of use to both researchers and practising managers. The objectives laid down in the beginning of the research could be finally achieved to a high degree of satisfaction. Like in all research, this work also has its limitations mentioned earlier. It also has laid ground for much more work in this area in future. This research was a very important learning experience for the researcher and has significantly contributed to his appreciation of the area of risky driving behaviour, safety attitudes and research methodology.

In spite of these facts, the following conclusions are made:

1. Young, male and less educated drivers were found to take higher risks of all kinds than females, old and well-educated drivers. The drivers being female, old and highly educated were found to score high in most of the attitudinal variables than young, males and less educated.

2. Personality trait has a clear impact on young, male and highly educated drivers' involvement in risky driving. i.e., young, male and educated (above degree) drivers who use sensation seeking and normlessness may engage in the most high-risk driving behavior. Because they find risky driving thrilling, rewarding and achieving their goals than do the older and female drivers.

3. By improving the attitude to rule obedience, attitude to speeding (reduce) and altruism and by shaping (reducing) sensation seeking and normlessness of the PTW drivers it is possible to reduce the effect of age and gender on risky driving behaviour.

4. Since the rule violations from PTW drivers may be due to their perception that "they are very skilled and believe that even if they disregard the rules, they would still be able to master the vehicle and avoid a crash". Another reason is that rule violation might have been carried out over a length of time without encountering any negative consequences due to favourable traffic conditions.

7.6 RECOMMENDATIONS

Based on this discussion, this study recommends strategies to promote road safety by: (1) enhancing drivers' safety attitudes and altruism and reducing their sensation seeking and normlessness through safety campaigns and educational programs among the majority of future drivers at the school level and pre-driver safety awareness programs (2) educating the PTW drivers about the potential traffic risks due to drunken driving, cell phone usage and driving without helmet and the terrible consequences of a crash (3) utilizing these results to design the pattern of test for learners driving license. The candidates scoring high on sensation seeking, normlessness and low on safety attitudes, family involvement may be allowed to attend the final driving test only after the successful completion of safety counselling programme aimed to enhance their safety attitudes and decrease their sensation seeking and normlessness.(4) Stringent enforcement of traffic law is necessary to mitigate rule violations of PTW riders.

APPENDIX

QUESTIONNAIRE

Request Letter to the Participants

Dear Sir/Madam

We are conducting a **ROAD SAFETY SURVEY** in Kerala, in order to study the influence of various factors which contribute the road accidents. You need not have to write your name or Mobile Number.

We request you to participate in this survey and give very correct information, so that it will enable us to bring the true reasons of road accidents in Kerala.

Thanking you,

Dr M N Vinodkumar,
Professor,
Division of Fire and Safety, CUSAT &

Thajudeen Hassan,
Research Scholar,
Division of Fire and Safety, CUSAT

PERSONAL DATA

AGE: **Years**

GENDER (Tick in the appropriate Box)

Male	Female

EDUCATIONAL QUALIFICATION (Tick in the appropriate Box)

Grade 10	Grade 12	Degree	Above Degree		
Have you ever met with an accident while driving a Two Wheeler				Yes	No

Theme of Questionnaire

1) My Father advice to obey traffic rules.

2) If something works, it is less important whether it is right or wrong

3) I act wild and crazy

4) I love excitement

5) I love to help others

6) Helmet will save my life

7) I think it is OK to speed if the traffic conditions allow you to do so

8) Driving 10 km/h above speed limit is OK, because everyone does it

9) There are many traffic rules which cannot be obeyed in order to keep up traffic flow

10) I don 't exam the function of the headlight, turning signal and braking light

11) I send SMS while driving

12) Break traffic rules due to Peer pressure

13) Disregard red light on an empty road

14) Exceed the speed limit in built up area by 15km/h

15) It is more important to keep up traffic flow than always follow traffic rules

16) Drive too close to the car in front

17) Once in a while I check the tyre condition

18) When I drive along with my friends they don 't mind if I am drunk and drive

19) If you are a safe driver it is acceptable to exceed10km/h in areas permitted to drive 50 km/h

20) Driving safely is more important than getting somewhere on time

21) My mother doesn't advice to obey traffic rules

22) I don't drive after drinking alcohol

23) Bend traffic rules in order to get ahead in traffic

24) I drive fast because the opposite sex enjoys it

25) I feel I am fully responsible for my driving

26) I always check the bike before a trip

27) It is OK to get round laws and rules as long as you do not break them directly

28) I act in direct way

29) During driving I listen FM radio

30) Drive on yellow light when it is about to turn red

31) Even though you have good skills, speeding is not OK

32) I drive recklessly because others expect me to do it

33) While driving I manage e-mail

34) Sometimes it is necessary to bend rules to keep traffic going

35) I have good word for everyone

36) It is better to drive smooth than always follow the traffic rules

37) Ignore the dangerous driving

38) Whenever I take bike, I have to tell my family where I am going

39) Riders I most respect wear helmet

40) I make feel people welcome

41) During driving I don't tune to music

42) I overtake the car in front when it is in the speed limit

43) My parents will not scold if I get home late because of safe speed

44) It is all right to do anything you want as long as you keep out of trouble

45) My family members drive safely even when they are in a hurry

46) I drive fast to show others that I am tough enough

47) I am concerned about others welfare

48) Drive fast to show others that I can handle the bike

49) Riding without a helmet could be the difference between life and death

50) I am willing to try anything once

51) Exceed the speed limit in rural area by 15km/h

52) Sometimes it is necessary to ignore traffic violations

53) Drive the wrong way, in one way road

54) I check the brakes before riding

55) Something can be wrong to do even though it is legal to do it

56) Break traffic rules because they are too complicated to follow

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SUBMITTED ON THE BASIS OF THIS THESIS

I   REFEREED JOURNALS

1. **T. Hassan, M.N. Vinodkumar and N. Vinod** (2017) Influence of demographics on risky driving behaviour among powered two wheeler riders in   Kerala,   India. *Transportation Research Part F,* **46,**24–33.

2. **T. Hassan, M.N. Vinodkumar and N. Vinod** (2017) Role of sensation seeking and attitudes as mediators between age of driver and risky driving of Powered Two Wheelers. *Journal of safety Research,***62,** 209–215.

II   PRESENTATIONS IN CONFERENCES

1. **T. Hassan and M.N.Vinodkumar**Investigations on the influence of age, genderand driving experience on risky driving behaviors of two wheeler riders in Kerala. *Proceedings of the International Conference on Energy, Environment, Material and safety (ICEEMS, 14),* CUSAT, Kochi, India, December, 2014.

2. **T. Hassan and M.N.Vinodkumar and N. Vinod** Predictors of Risky Driving ofPowered Two Wheeler Riders of Kerala, India. *International Conference on safetyand Fire Engineering (Safe 17),* CUSAT, Kochi, India, April, 2017.

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