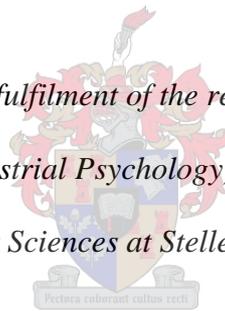


**DRIVING ANGER: THE ROLE OF PERSONALITY ATTRIBUTES,
EMOTIONAL INTELLIGENCE, GENDER AND AGE**

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*Thesis submitted in partial fulfilment of the requirements for the degree of
Master of Commerce (Industrial Psychology) in the Faculty of Economic
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DECLARATION

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ABSTRACT

It is stated that, in South Africa, 90% of accidents can be blamed on human error (Venter, 2010). Furthermore, the same study shows that only between 3% and 5% of traffic accidents could be blamed on the environment in which the individual is travelling, and another small percentage of accidents can be attributed to flaws of the vehicle.

Driving anger can be defined as the propensity to become angry while driving, an individual characteristic unique to every driver (Deffenbacher, Deffenbacher, Lynch & Richards, 2003). Research shows that high driving anger is related to risky driving behaviours, such as fast driving, reckless manoeuvres and violations of traffic laws (Sarbescu, Costea & Rusu, 2012; Villieux & Delhomme, 2010). The study of driving anger includes the way an individual experiences or deals with anger. Hence, driving anger is assumed to form part of internal factors (driver characteristics) impacting a larger, more complex system. This complex system consists of external and internal factors working together that consequently influence each other and traffic safety (i.e. traffic outcomes and consequences).

The main objective of this study was to develop a structural model, based on the current literature, which explains the antecedents of driving anger, and to empirically test this structural model. The antecedents comprise personality attributes (agreeableness, conscientiousness, neuroticism, openness to experience and extraversion), emotional intelligence, gender and age, and the impact that these factors have on driving anger.

An *ex post facto* correlational design was used to test the hypotheses formulated specifically for the purpose of the current research study. Convenience sampling (as well as elements of stratified random sampling) was used to select a sample. Quantitative data was collected from a total of 199 drivers; 50 professional and 149 non-professional drivers. An online electronic survey was distributed to Pepkor and Lube Marketing employees, amongst others using social media and networking strategies. The following measurement instruments were used: (1) the International Personality Item Pool (IPIP) (Dahlen & White, 2006), (2) the Schutte Emotional Intelligence Scale (SEIS) (Davies, Lane, Devonport & Scott, 2010), and (3) the Driving Anger Scale (DAS) (Deffenbacher, Oetting & Lynch, 1994). Gender and age were measured via biographical questions asked in the survey. Item analysis, partial least squares (PLS) and

multiple regression analysis were conducted to analyse the data that was collected and also to report on the nature of the paths.

From the 18 hypotheses formulated in the study, one was found to be statistically significant, namely, the relationship between neuroticism and driving anger. This implies that those high in neuroticism are most likely to experience driving anger. It is important to note that, of the statistically insignificant paths, 12 were related to moderating effects. These statistically insignificant results could be due to many reasons and is discussed in the study.

The study has shed some light on the understanding of driving anger and its antecedents as related to professional and non-professional drivers. Based on the results reported, possible interventions for industrial psychologists and managers were suggested to foster a safe driving culture. Furthermore, the limitations of the study and recommendations for future research were discussed.

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TABLE OF CONTENTS

DECLARATION	i
ABSTRACT	ii
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER 1	1
BACKGROUND TO THE STUDY	1
1.1 INTRODUCTION	1
1.2 DRIVER BEHAVIOUR	3
1.3 DRIVER ANGER WITHIN A DRIVER BEHAVIOUR MODEL	5
1.3.1 Level 1: Individual characteristics of other road users	6
1.3.2 Level 2: Organisational and community factors	7
1.3.3 Level 3: National level	8
1.3.4 Level 4: Economy and culture	9
1.3.5 Internal factors	10
1.4 RELEVANCE OF THE STUDY	11
1.5 RESEARCH-INITIATING QUESTION	14
1.6 OBJECTIVES AND AIM OF THE STUDY	14
1.7 DELIMITATIONS	14
1.8 OUTLINE OF THE RESEARCH STUDY	15
CHAPTER 2	16
LITERATURE STUDY	16
2.1 INTRODUCTION	16
2.2 INDIVIDUAL CHARACTERISTICS RELATED TO DRIVING ANGER	16
2.3 PROFESSIONAL DRIVERS AND DRIVING ANGER	19
2.4 RELEVANT LATENT VARIABLES	22
2.4.1 Personality	22
2.4.2 Emotional intelligence	28
2.4.3 Gender	32

2.4.4	Age	34
2.4.5	Driving anger	35
2.4.6	Summary	37
2.5	RELATIONSHIPS BETWEEN LATENT VARIABLES	38
2.5.1	Personality attributes and driving anger	38
2.5.2	Emotional intelligence and driving anger	42
2.5.3	Moderator variables: gender and age	44
2.5.4	Summary	46
2.6	TRAFFIC ACCIDENTS AS A CONSEQUENCE OF DRIVING ANGER	46
2.7	CONCEPTUAL MODEL	49
2.8	CHAPTER SUMMARY	49
CHAPTER 3		51
RESEARCH DESIGN AND METHODOLOGY		51
3.1	INTRODUCTION	51
3.2	SUBSTANTIVE RESEARCH HYPOTHESES	52
3.3	THE STRUCTURAL MODEL	54
3.4	STATISTICAL HYPOTHESES	56
3.5	RESEARCH DESIGN	59
3.6	RESEARCH PROCEDURE AND SAMPLING SIZE	61
3.7	MEASURING INSTRUMENTS	63
3.7.1	Big Five personality factors	63
3.7.2	Emotional intelligence	65
3.7.3	Gender and age	67
3.7.4	Driving anger	70
3.8	MISSING VALUES	71
3.9	STATISTICAL ANALYSIS	72
3.9.1	Data analysis	72
3.9.2	Computer package	73
3.9.3	Item analysis	73
3.9.4	Structural equation modelling (SEM): Partial least squares (PLS)	74
3.10	RESEARCH ETHICS	75

3.11	CHAPTER SUMMARY	77
	CHAPTER 4	78
	RESULTS	78
	4.1 INTRODUCTION	78
	4.2 VALIDATING THE MEASUREMENT MODEL	78
	4.2.1 Item analysis	78
	4.3 PARTIAL LEAST SQUARE (PLS) ANALYSES.....	82
	4.3.1 Evaluation and interpretation of the measurement model	82
	4.3.2 Evaluation and interpretation of the structural model.....	89
	4.4 CHAPTER SUMMARY.....	98
	CHAPTER 5	100
	IMPLICATIONS, LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH	100
	5.1 INTRODUCTION	100
	5.2 PRACTICAL IMPLICATIONS	101
	5.2.1 General implications for professionals and non-professional drivers.....	102
	5.2.2 Implications aimed specifically at the results of the present study.....	103
	5.2.2.1 Organisational level interventions	104
	5.3 LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH	113
	5.4 CHAPTER SUMMARY.....	114
	REFERENCES	116

LIST OF TABLES

Table 3.1: Summary of Latent Variables.....	56
Table 3.2: Biographical Information of the Sample ($n = 199$).....	68
Table 4.1: Means, Standard Deviations and Internal Consistency Reliabilities of Subscales.....	79
Table 4.2: Reliability Statistics of the PLS Model.....	84
Table 4.3: Outer Loadings.....	85
Table 4.4: R Squares Scores for the Endogenous Variable.....	91
Table 4.5: Path Coefficient between Variables.....	92
Table 4.6: P-values for Gender as Moderating Effect.....	96
Table 4.7: P-values for Age as Moderating Effect.....	97

LIST OF FIGURES

Figure 1.1. Driver behaviour model.....	6
Figure 2.1. Emotional intelligence theoretical model.....	31
Figure 2.2. Conceptual model.....	50
Figure 3.1. Structural model.....	55

CHAPTER 1

BACKGROUND TO THE STUDY

1.1 INTRODUCTION

Traffic psychology has been defined as the study of the behaviours of road users and the underlying psychological processes underpinning these behaviours (Rothengatter, 1997). Hence, traffic psychology attempts, inter alia, to identify causes of driving behaviours. The aim is to eventually develop interventions that would effectively lessen traffic accidents, and possible interventions could include behaviour modification through training or rehabilitation that focuses on the road user (Rothengatter, 1997; Uzumcuoglu, Özkan, Lajunen, Morandi, Orsi, Papadakaki, & Chliaoutakis, 2016). The modelling of behaviours could also be used to change driver behaviours by considering route planning, driving ‘values’, manoeuvring mannerisms etc. (Rothengatter, 1997).

Traffic accidents have triggered concerns for the safety of road users. Typically, the causal focus has been on the transport systems (which is said to consist of the physical environment, the road user, and his/her vehicle) by adapting the environment (e.g. crash-barriers), and by improving the engineering of motor vehicles (e.g. safety belts) (Rothengatter, 1997). However, very little progress has been made to intervene in the human element of driving. Therefore, influencing driving behaviour with the use of traffic psychology will be a challenge in the future (Rothengatter, 1997).

Further research has stated that, without intensive action, traffic-related injuries and deaths are expected to double by 2030 (Davies & Roberts, 2014). The World Health Organization (WHO) has highlighted the international issue of road traffic accidents and the urgent need for the implementation of effective interventions. In addition, the WHO has introduced a procedure to monitor the progress in the prevention of these traffic-related accidents, called Global Status Reports (Davies & Roberts, 2014).

However, concern has been raised regarding the prevention of traffic accidents; because the WHO has limited financial resources, it relies on private sector and organisational donors. To decrease vehicle use as a strategy to decrease road traffic accidents would be beneficial for health, safety

and environmental reasons, but research has also shown that a decrease in vehicle use would be in conflict with corporate goals and objectives i.e. a decrease in courier services, deliveries, customers, etc. (Davies & Roberts, 2014). Hence, it is important to include professional drivers as contributors to road safety and corporate objectives in the study of traffic psychology and this aspect thus warrants attention.

Several studies on traffic and transportation have concluded that the human factor is responsible for 85 to 90% of road accidents (Jonah, 1997; Iversen & Rundmo, 2002). More than one million traffic-related deaths were reported across the world for the year 2010, amounting to more than 3 000 deaths per day (Rowe, Roman, McKenna, Barker & Poulter, 2015). The studies of road user behaviours have always been part of the field of ergonomics and engineering. However, the study of the psychological processes inherent in driving behaviours recently has increased and has led to what is now known as the field of traffic psychology (Rothengatter, 1997).

Driving behaviour is said to be part of a complex nomological network which could be very broad in nature. Several studies have suggested that anger while driving could be a predictor of driving behaviours, hence, the focus of this study hones into driving anger as a driving behaviour and the impact that various individual characteristics (personality and demographic aspects) may have on driving anger as a trait (Stephens, Hill, & Sullman, 2016). The relationship between driving behaviours and driving anger has been identified using various techniques such as self-report surveys, driving simulators etc.; for example, studies have found that as state anger increases, driving speeds increase (Stephens et al., 2016). Furthermore, it has been suggested that reaction time decreases as driving anger increases. Stephens et al. (2016) also suggest that some individuals are more predisposed to driving anger than others and that this propensity could be measured across various driving conditions.

The essence of traffic psychology is to investigate human behaviour behind the wheel, and how it relates to the environment, the aspects of the vehicle and other factors that are outside the control of the individual. The reasons why people behave on the roads the way they do are of importance here. Psychology as a field of study relates to the individual and his or her psychological processes and attendant behaviours. All humans are complex beings and each person has his/her own reasons for the way in which they behave. This is applicable to South African roads as well, where drivers behave on the road as their personalities guide them in response to environmental factors.

1.2 DRIVER BEHAVIOUR

Driver behaviour refers to the interaction between the road user and the environment travelled (Özkan & Lajunen, 2011). The road user is said to be the human component in traffic psychology; the environment is referred to as comprising the vehicle- and environment-related factors. Therefore, three facets have proven to influence road safety, namely the vehicle, the environment and the human element (being the driver). Of these three factors, the human element has been identified as the most complex factor, accounting for the most variance in traffic accidents (Herrero-Fernandez, 2016).

As mentioned, the human aspect is a complex multicultural factor within traffic psychology (Özkan & Lajunen, 2011). Hence, outcomes such as speeding, accidents, road rage, etc. are a result of the interactive relationship between the complex human factor and the surrounding environment, both inside and outside the vehicle (Özkan & Lajunen, 2011). It therefore is necessary to study the psychological, subjective responses and behavioural outcomes that drivers experience and show while driving (Herrero-Fernandez, 2016).

Traffic psychology focuses predominantly on the individual driver characteristics and attendant behaviours. These behavioural aspects could be grouped into driving behaviour and driving performance or skill respectively (Özkan & Lajunen, 2011). Driving behaviour refers to the driving style that the individual adopts (this could also be based on driving habits); driving performance refers to individual information processing and various driving skills (such as safety skills). These skills can be improved through training and practise (Özkan & Lajunen, 2011). Studies that focus on human and behavioural elements have determined that risky driving and driving anger are the main predictors of road accidents (Chliaoutakis et al., 2002; Dahlen, Martin, Ragan & Kuhlman, 2005; Dahlen & White, 2006).

The most relevant human factor relating to traffic accidents is driving anger. This human element has been found to have a negative impact on cognitive variables such as attention, information processing and perceptions; cognitive variables such as these are essential to driving (Herrero-Fernandez, 2016; Zhang & Chan, 2016). Anger is a powerful emotion, which is associated with negative feelings directed towards the cause of the anger; muscle tension and arousal of the nervous system accompanies this emotional state (Zhang & Chan, 2016). Anger mostly occurs in response to a disruption in behaviour or as a response to an actual or perceived threat. This

emotional state has been found to be more frequently experienced in the driving environment than in non-driving environments (Zhang & Chan, 2016).

Driving anger has been divided into and compared in the form of low-anger and high-anger drivers. Studies show that high-anger drivers commit increased traffic violations when compared to low-anger drivers. Through simulation tasks, the experience of anger has been linked to loss of control of the vehicle, loss of concentration, and higher chances of causing car accidents (Bogdan, Mairean & Havarneanu, 2016; Herrero-Fernandez, 2016).

Using cardiovascular indices, differences can be seen between high and low anger states; more specifically, in relation to blood pressure and heart rate, differences can be identified between the two anger expressive states. With a significant increase in blood pressure and heart rate, it is clear that anger states are more intense when compared to a calm, relaxed state (Herrero-Fernandez, 2016). Cardiovascular measures were found to be the best way of differentiating between high-anger and low-anger driving expressive behaviours, as the heart index was found to increase as stressful situations increased (Herrero-Fernandez, 2016).

Sensation seeking and driving anger are found to be related to one another in that, with an increase in anger, there could be an increase in sensation seeking (speeding, reckless driving, dangerous manoeuvres, etc.); i.e. high-anger drivers will display more risky, aberrant driving behaviours than those who are less likely to experience intense anger emotions (Herrero-Fernandez, 2016; Zhang & Chan, 2016).

Research suggests that human error could be explained through two possible models. The first are person models; the focus is on the errors made at an individual operator level. The road user and his/her behaviour is taken into consideration as a determinant of traffic accidents (Özkan & Lajunen, 2011) (this conceptualisation is favoured in the current study, as discussed in Chapter 2); the second are system models, which focus on the relationships between the human element and wider systematic errors (Özkan & Lajunen, 2011). Systematic models consider maladjustments in the relationships between the person and other complex systems (for example, infrastructure and vehicle-related issues). A driver behaviour model (discussed in Section 1.3) will be used as a theoretical framework to display how driving anger fits within a wider systematic model.

There are thus three factors involved in traffic psychology, namely the vehicle, the environment and the driver with his/her particular behaviour. These elements form part of a wider system and can be grouped into external and internal factors that affect driving outcomes and consequences. Driving anger is discussed in the next section as part of the theoretical model, namely the driver behaviour model.

1.3 DRIVER ANGER WITHIN A DRIVER BEHAVIOUR MODEL

As mentioned above, traffic psychology investigates the relationship between the driver, the vehicle and the environment travelled. Thus, one should question, in the larger scheme of road traffic, how a driver is influenced and how does this impact on the safety on South African roads? The driver behaviour model below (Figure 1.1.) shows this interaction between external factors and internal factors (where driver characteristics are the focus in this study), and the influence it could have on driving outcomes, namely traffic safety and traffic accidents. As a theoretical framework, the model presents traffic psychology (and driving anger) within a larger/wider system.

External factors (depicted as four levels) include aspects such as individual characteristics (of other drivers), organisational and community factors, national factors, and economic and cultural factors. Internal factors (interacting with external factors) would be the environment travelled, the vehicle in use, and driver characteristics (the focus of the study). Research suggests that the level of traffic safety is determined by the manner (directly or indirectly) in which internal and external factors interact within this larger system; the result of this interaction determines the outcome or consequences (e.g. accident exposure and involvement) on South African roads (Özkan & Lajunen, 2011).

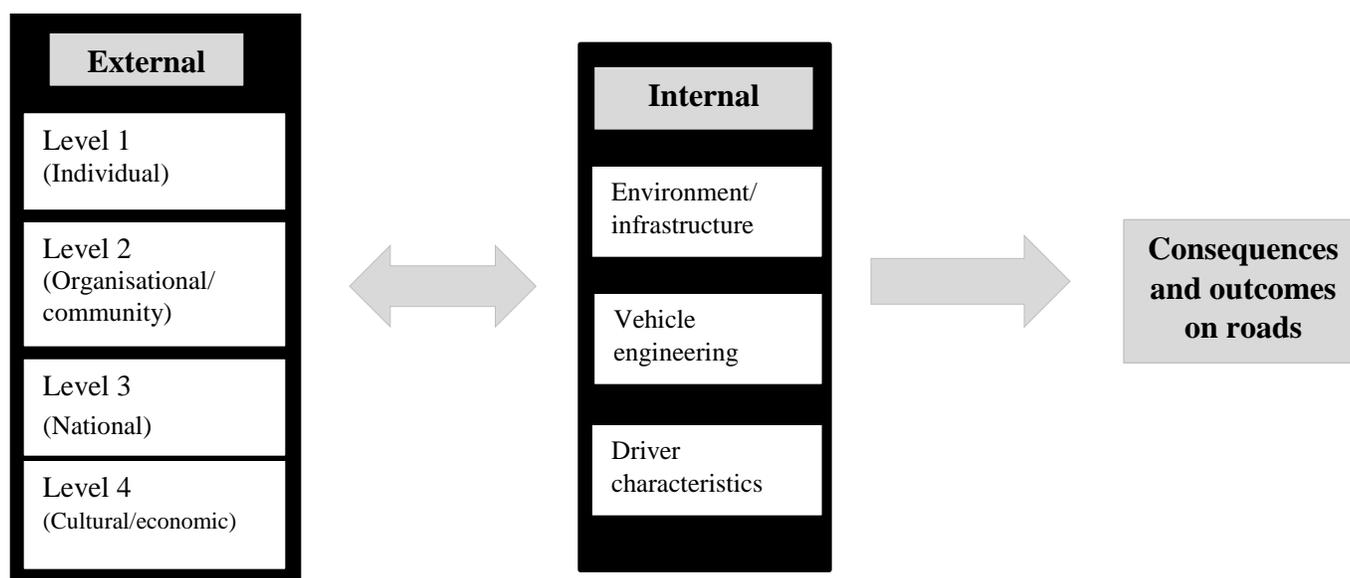


Figure 1.1. Driver behaviour model

1.3.1 Level 1: Individual characteristics of other road users

Road users have to interact with each other on a daily basis; through this interaction, the other's intentions and driving behaviours are taken into account in order to drive safely (Özkan & Lajunen, 2011; Stephens & Sullman, 2015). Because there are minimal means for communication when driving, an individual's vehicle becomes his or her means of communication; lack of communication may lead to possible misunderstandings (Bjorklund, 2008; Zhang & Chan, 2016). The way in which external drivers communicate could possibly impact driver characteristics (and behaviour) as an internal factor in traffic safety.

The driving styles and performance of other drivers are said to be as unique as personality, gender, age or cognitive processes (e.g. information processing and perceptions). Just as each individual differs regarding these personal attributes, so do his/her driving behaviours differ from one another. These differences in driving behaviours are presented in this study as external behavioural characteristics in the study of traffic safety; in other words, what impact do other drivers and their behaviours have on road users?

Research suggests that age and gender are related to driving styles, propensity to become angry and accident risk; young male adults are involved in more car accidents than females. In addition, young individuals and males tend to take more risks and commit more rule violations while driving

(Bogdan et al., 2016; Özkan & Lajunen, 2011). This being said, the age and gender of other drivers increase the risk of road use. Based on literature, with an increase in young adult drivers there is a possibility for an increase in the accident exposure of other drivers (Zhang & Chan, 2016). Thus, considering gender and age differences, the mannerisms of external drivers, as well as their risk-taking tendencies, have the potential to influence the driving behaviours of other road users. Therefore, taking into account the larger system of driving behaviours, the individual characteristics and the intensity of driving anger of external drivers influence the traffic safety and accident exposure of road users (Özkan & Lajunen, 2011).

1.3.2 Level 2: Organisational and community factors

There are many businesses in South Africa that make use of professional drivers for their functioning (e.g. transportation and delivery companies). Hence, professional drivers use the roads as a means to an end; a non-professional driver therefore will be the everyday road user. Non-professional drivers have the freedom to determine acceptable risk levels for their driving, which method of transportation they could utilise, their target speed and, finally, the time they need to travel to their destination. Conversely, professional drivers are influenced by the rules, procedures and culture of the organisation in which they are employed; these factors determine why, how and where they drive. Companies are complex in that they acquire different views, values and principles, which result in perceptions about what are acceptable driving behaviours and what are not. These perceptions act as a frame of reference for directing professional drivers.

Research shows that most violations occur among professional drivers who are in organisations where compliance with rules and regulations is reported to be low (Özkan & Lajunen, 2011). The lowest number of violations occurs within organisations where rules, regulations and culture are highly evident. Therefore, it is expected that organisational factors (such as culture, rules and regulations) influence professionals' driving behaviours (Özkan & Lajunen, 2011). Professional drivers are specifically important within the current study; based on the driver behaviour model, organisational factors and influences can regulate general driving behaviours.

Furthermore, a community has the potential to affect driving behaviours. Various geographical areas have specific driving mannerism; the community identifies driving behaviour that is acceptable and behaviours that are not socially acceptable (Özkan & Lajunen, 2011). Most of the time drivers conform to social norms developed by their communities. It is assumed that drivers

from different geographical areas act and respond in a manner that is learned or observed in these communities. They therefore may have specific ideas and understandings of road rage behaviour, speeding as well as risky driving behaviours; in other words, what may be seen as driving anger behaviours in one geographical area may not be seen as driving anger in another.

1.3.3 Level 3: National level

Just as communities affect driving behaviours, so do various countries and their respective legislation influence road users (Zhang & Chan, 2016). Research shows that even though various countries have similar climates, there are different traffic practices, regulations and policies that govern the driving behaviours of citizens. The governance of certain countries was investigated in terms of traffic accidents and fatalities. Özkan and Lajunen (2011) suggest that aspects such as public accountability, political stability, effectiveness of government and public awareness increase or decrease traffic accidents and fatalities. In other words, where governance is high in a specific country, traffic fatality rates are expected to be lower. Where governance is low, traffic fatality rates are high; this is also true where strict traffic regulations are in place (Özkan & Lajunen, 2011). Traffic policies and regulations are effective in enforcing certain driving behaviours; however, it does not change the perspective of the driver. Hence, traffic fatalities remain high if governance is low (Özkan & Lajunen, 2011).

The road traffic report compiled by the Arrive Alive campaign in South Africa indicate that, from April 2010 to March 2011, just less than 14 000 traffic related fatalities were recorded (*Road Traffic Report [Online]*). It was also reported in 2008 that, within a population of 100 000 people, 26 children passed away as a result of traffic accidents (Venter, 2010). An additional statistic has identified that just less than 400 000 people were victims of fatal traffic accidents in Southern Africa from 1903 (which was when the first car accident took place in Cape Town) up until 2003 (Venter, 2010). In the United States of America, it was found that 42 643 people died out of a total of 6 328 000 people who were involved in accidents (Dahlen & White, 2006). Further studies have also shown that driving anger will differ between countries (Bogdan et al., 2016).

Our country has the responsibility to implement better procedures for determining the main factors behind these human errors. It would be detrimental if our population continued to decrease due to factors that could, in turn, be reduced. Governance within the country should also be considered. As stated above, traffic rules and regulations are not sufficient to change driver behaviours.

Death due to car accidents does not only affect families, but the country as a whole. Hence instruments that measure driver behaviour should be researched, improved and implemented. For this to happen, sufficient data is needed. Unfortunately, South Africa is deficient in the areas of traffic psychology and driver behaviour.

1.3.4 Level 4: Economy and culture

a) Economy

Other than national influences, there are economic and cultural influences on driving behaviour; in the same manner, traffic accidents have a negative impact on South Africa's economy. Özkan and Lajunen (2011) suggest that higher-income countries are able to invest more in traffic safety (education, improved safety of vehicles, etc.) and road infrastructure. Conversely, lower income countries cannot invest as much money in road infrastructure and traffic safety (Özkan & Lajunen, 2011). Furthermore, higher income countries have more inexperienced adult road users; research has found that where there is a 10% increase in young road users (all other factors held constant), there will be an increase in traffic fatalities of roughly 8% (Özkan & Lajunen, 2011). Due to the ability to pay more for leisure activities and necessities (such as fuel and vehicle maintenance), there is an increase in road use, which creates a higher probability of being involved in an accident (Özkan & Lajunen, 2011; Li, Yao, Jiang & Li, 2014).

Other than the influence of the economic state of a country on traffic accidents, there is also the concern of the effect of traffic accidents on the GDP/GNP. The more costs that are incurred from accidents, the more funds are taken from the GDP and GNP of South Africa. Research shows that car accidents cost Africa around 1 to 3% of its GNP (Venter, 2010). In turn, this decreases what could have been budgeted for education and public services.

Additional aspects that should be considered regarding the economic costs are that of loss of productivity, medical as well as rehabilitation costs, costs due to the damage of property, legal expenditure, etc. (Dahlen & White, 2006). The Road Accident Fund is a government initiative that provides financial support to those who have been involved in traffic accidents. This initiative is funded by means of public tax. Therefore, as accidents increase, so will the cost of living, i.e. tax and fuel levies. From a business perspective, if a professional driver is in a car accident, a company's productivity could decrease for the period that the employee is not at work; there

furthermore will be the maintenance and restoration costs of the vehicle (which is an asset to the company). If an employee passes away due to the accident, his or her company (over and above legislative costs) would have to carry the costs of recruiting and training new employees.

It could be assumed that property damage caused by road accidents (as well as everyday road use) is a major cost for a government. Different environments consist of different elements that either hinder road users or are damaged because of traffic accidents. Either way, it is expensive for the infrastructure to be rebuilt or replaced; the labour used for the repairing thereof adds to these costs. In the United States of America, a total of \$230.6 billion was paid in 2000 for costs that were incurred from car accidents. Being more than 15 years later, the current costs are expected to have increased dramatically since then due to aspects such as inflation (Dahlen & White, 2006).

b) Culture

Özkan and Lajunen (2011) use Hofstede's (2001) cultural dimensions to explain the possible effect that culture could have on driving behaviour. Power distance, uncertainty avoidance, individualism and collectivism, masculinity and femininity, and long-term versus short-term goals are used to study cultural dimensions and their effect on driving behaviours (Özkan & Lajunen, 2011). It has been suggested that masculine cultures are positively related to speeding behaviours. In addition, masculinity and uncertainty-avoidant cultures are positively related to traffic deaths. It is evident that a country's culture affects what is socially acceptable and what behaviour is tolerated amongst drivers (Bogdan et al., 2016; Özkan & Lajunen, 2011).

With South Africa being such a diverse nation, one needs to realise how different South Africans are. Each individual has a different perception of how to behave in a vehicle, and these are the aspects that need to be determined and measured; these aspects are also related to personality and culture (as mentioned above). There are many cultures within South Africa, and this influences what individuals view as right and wrong. The differences (in culture) on the roads influence road users and could cause a variety of traffic problems.

1.3.5 Internal factors

Regarding internal factors, environmental influences like geography, sophistication/quality of infrastructure, and climate (snow, rain, fog etc.) have the potential to affect drivers' behaviours (Özkan & Lajunen, 2011). For example, where there are terrible weather conditions, drivers will

adapt their behaviours accordingly; the same can be said for poor infrastructure (such as faulty traffic lights, potholes, poor street lighting, etc.), where the driver is forced to make judgements and adjustments in driving behaviour. These climatic and environmental factors are expected to remain consistent over time and also influence vehicle engineering more than what individual differences would, for example a road with many potholes could damage a car, increasing the accident exposure of the driver; another example is a hail storm, which could also be dangerous for road users and consequently will have an effect on driving behaviours. Hence, where road infrastructure is poor, vehicles and drivers are at risk.

A behavioural study suggested that there was a decrease in drivers running the red light at an intersection if speed cameras were present (Polders et al., 2015). It therefore was determined that there was a significant difference in driver behaviour between an intersection with a speed camera and an intersection without a speed camera present. Furthermore, rear-end collisions decreased with the presence of a speed camera (Polders et al., 2015).

Finally, individual (driver) characteristics also form part of internal factors and are the focus of the current study. Driver characteristics refer to the driver him/herself. Aspects such as personality, cognitive processing, perceptions, gender, age, stress, etc. make up driver characteristics (Ge et al., 2014; Özkan & Lajunen, 2011; Stephens & Sullman, 2015). As a result, the driving anger of non-professional and professional drivers is said to form part of driver characteristics.

Grounded within this theoretical model, therefore, driving anger (i.e. driver characteristics) forms part of the larger system of traffic safety and is influenced by aspects such as other drivers' characteristics, organisational regulations, community influences, national legislation, economic status, cultural influences, environmental conditions, vehicle engineering and, most importantly, other characteristics of the driver him/herself (such as personality, age, gender and emotional intelligence). The interaction of these internal and external factors essentially affect (directly or indirectly) accident risk and exposure and will be discussed further in the next section.

1.4 RELEVANCE OF THE STUDY

In South Africa, 90% of accidents can be blamed on human error (Venter, 2010). Venter (2010) has identified that only 3% to 5% of traffic accidents can be blamed on the environment in which the individual is travelling, and another small percentage can be attributed to flaws in the vehicle.

Driving anger can be defined as the propensity to become angry while driving, an individual characteristic unique to every driver (Deffenbacher et al., 2003). Research shows that high driving anger is related to risky driving behaviours, such as fast driving, reckless manoeuvres and violations of traffic laws (Sarbescu et al. 2012; Villieux & Delhomme, 2010). The study of driving anger includes the way an individual experiences or deals with anger. Hence, driving anger is assumed to form part of internal factors (driver characteristics) affecting a larger, more complex system. As mentioned before, external and internal factors influence each other, and consequently influence traffic safety (i.e. traffic outcomes and consequence).

On a daily basis, news articles identify the shocking behaviours on South African roads. Most of South Africa's problems reside in road safety (Venter, 2010). As mentioned, statistics show that human error is the main cause of accidents on the roads. Error can be defined as the inability of actions to result in intended consequences. Rule violation is also an important concept when considering driving anger; rule violation refers to purposeful deviation from driving practices that are believed to be necessary for safety on the roads (Özkan & Lajunen, 2011).

Research has shown that anger can manifest in a variety of ways. Aggression as a component of anger that promotes the occurrence of driver anger; it therefore is an important factor to consider within the study of driving anger. Two types of aggression can be identified, namely: instrumental and hostile aggression (Bjorklund, 2008). Instrumental aggression is defined as the type of aggression in which the goal is the most important. The intention is not to cause harm to others, but to obtain a certain end; for example, driving as fast as possible. Other individuals then bear the negative consequences. The second type is that of hostile aggression; the driver's intention is to harm others. Bjorklund (2008) says that individuals do this to relieve frustration. This therefore is classified under the grouping of driving anger.

Driving anger has become a serious problem over the past few years. It includes physical assault aimed at injuring or killing a fellow driver (Deffenbacher, Lynch, Oetting & Swaim, 2002; Herrero-Fernandez, 2011). In newspapers and on online news websites there constantly are reports on incidents of road rage. In many cases the driver characteristics of these individuals are questioned regarding the internal influences of the behaviour.

Furthermore, driver characteristics (within the theoretical framework) include driver perceptions, defined as cognitive processes. Numerous perceptions can affect the intensity of driver anger, as

well as the timing of this anger. This aspect is significant, because when we perceive reality, our perceptions and senses assist us in creating meaning thereof. Eyesight as a sense allows us to see close and far; it also controls the amount of light that is seen by an individual. Aspects hindering eyesight could contribute to the behaviour of the driver. Other senses are the nose, for different smells, and ears for various noises. Any unpleasant situations caused by another driver could impair another individual's driving, or it could aggravate and irritate fellow road users (Bucchi, Sangiori & Vignali, 2012; Villieux & Delhomme, 2010).

Extraversion, a characteristic of personality, is seen as an important determinant when looking at driving anger. Dahlen, Edwards, Tubré, Zyphur and Warren (2012) have shown a positive relationship between these two variables. Neuroticism is also positively related to accidents and deaths. Conscientiousness is negatively related to accidents, implying that the more conscientious an individual is, the less the personality affects negative behaviour (Dahlen & White, 2006). The question that remains, however, is which variables serve as the antecedents of driving anger?

Anger has a propensity to limit the amount of information that an individual can take in. This then impairs thinking (Herrero-Fernandez, 2011; Iversen & Rundmo, 2002). This then means that irrational decisions are made due to the lack of concentration and the inability to think clearly (this relates to cognitive processes, as mentioned above). The tendency to become angry on the road is a worldwide phenomenon; it is not restricted to South Africa. Therefore, our government should strive to investigate the reasons behind driving anger (national factors within the theoretical model) and develop relevant interventions that could lessen the effect.

This study investigates driving anger (of professional and non-professional drivers) as part of driver characteristics (internal factors). However, it is also important for us to determine other driver characteristics that affect driving anger (for example which personality attributes will affect driving anger). As presented in the model, driving anger, interacting with other internal and external factors, has the potential to affect the safety on South African roads. This study contributes to the available knowledge related to driving anger and its antecedents and thereby possibly will contribute to efforts directed at reducing anger on the roads.

1.5 RESEARCH-INITIATING QUESTION

Research on the antecedents of driving anger is limited, especially in the South African context. Cultural elements within South Africa could be important when considering general behaviours, as well as driving behaviours. Furthermore, research that is available on driving behaviours does not consider the regulation of emotions as an influence on driving anger. Do emotions and the ability to regulate emotions influence driving behaviour and, likewise, does personality influence driving behaviour in a South African context? Which other driver characteristics are important when looking at driving anger, and what role does this play in promoting traffic safety? The research question is therefore formulated as follows:

“Which prominent individual characteristics influence variation in driving anger?”

1.6 OBJECTIVES AND AIM OF THE STUDY

The main objective of the study was to develop a structural model, based on the current literature, which explains the antecedents of variance in driving anger, and to empirically test each of the individual paths of the structural model.

The research aimed to

- Investigate the phenomenon of driving anger;
- Based on the literature review, identify and test prominent antecedents of driver behaviours on the roads, i.e. the extent to which specific individual characteristics influence driving behaviours;
- Highlight findings and conclusions and suggest implications for professional drivers in industry; and
- Identify other major determinants of driving anger as recommendations for future research in the area of traffic psychology, which has not yet been considered previously.

1.7 DELIMITATIONS

The researcher aimed to determine the prominent antecedents of driving anger, and its effect on traffic safety, based on a literature review. Data was gathered using a sample of participants with valid driving licenses from the general population, as well as professional drivers, in order to determine prominent variables that influence driving behaviours amongst these professional

drivers. The driver behaviour model (Özkan & Lajunen, 2011) was used as a theoretical framework for the study of driving anger, and for the development of a theoretical structural model. Hypotheses were developed relating to the structural model and tested. No effort was made to improve the psychometric properties of the measures used by manipulation of the dataset.

1.8 OUTLINE OF THE RESEARCH STUDY

Chapter 1 has offered an overview of traffic psychology and driving behaviours, especially within a South African context. This was followed by the driver behaviour model developed by Özkan and Lajunen (2011). This model focuses on driver behaviour and considers the relationship between external and internal factors, as well as the affect that this interaction has on traffic safety. The research-initiating question and relevance of the study have been discussed, as well as its aims and objectives.

Chapter 2 provides an in-depth look at current literature regarding driving behaviours, traffic safety and the relationship between the two. The literature review looks to satisfy the theoretical objective of the current study. The latent variables are defined and explained in terms of the current academic literature. The relationships between the variables of interest are explored, following the discussion of the theoretical model developed to graphically portray the hypothesised relationships.

Chapter 3 presents the research methodology used to empirically test the theoretical structural model that was developed and portrayed in Chapter 2. This chapter also includes a discussion of the research design, the participants, measuring instruments, missing values and statistical analyses. Finally, the substantive research hypothesis is presented and the structural model is shown.

Chapter 4 describes the results derived from the statistical analyses. This includes a discussion of participant scores and interpretation of the hypotheses. The final chapter considers managerial implications. Practical interventions are also addressed in Chapter 5, as well as the limitations of the study and recommendations for future research.

CHAPTER 2

LITERATURE STUDY

2.1 INTRODUCTION

As depicted in the driver behaviour model in Chapter 1, driving is a complex practice that involves driver characteristics operating in a social exchange process and that is influenced by other external and internal factors, impacting traffic safety as a whole (Hennessy, 2011). Hence, the study of driver characteristics is, in this case, the focal point of traffic safety research. The environment, vehicle engineering (internal factors in the driver behaviour model) and other external factors continuously influence the thoughts, feelings and behaviours of drivers; research by Hennessy (2011) supports this notion and states that the environment consists of physical factors (temperature and climate), cultural factors (also mentioned within the theoretical framework), and temporal factors (such as time urgency), etc.

The behaviour of the driver is the product of the interaction between these internal and external factors. Considering driver characteristics, the feelings, thoughts, attitudes and reactions of each unique driver are determined by the driving environment (external and internal) that surrounds him/her (Hennessy, 2011; Vardaki & Yannis, 2013). Depending on various driving behaviours, traffic safety is either said to increase or decrease. External factors (and many internal factors) of road users are endless and therefore will not be the focus of this study; they are, however, taken into consideration for future research purposes. Driver characteristics, including driving anger, and other driver characteristics influencing driving anger will be the core of the current study.

It is important to note that there are numerous elements in the self (driver characteristics) that produce driving anger. These factors will not form part of the current study, but will be acknowledged as possible driver characteristics affecting future research and interventions. The next section will investigate other major factors influencing driving anger.

2.2 INDIVIDUAL CHARACTERISTICS RELATED TO DRIVING ANGER

Bogdan et al. (2016) present the difference between driving aggression and driving anger. Their study shows that driving aggression is a type of behaviour directed at hurting another individual, either on a physical or emotional level. Driving anger (considering trait anger and trait driving

anger) is the emotion one feels whilst driving. More specifically, trait anger is expressed on an emotional, physical, cognitive or behavioural level. Trait driving anger refers to the concept of anger experienced in driving contexts, characterised by an intense and frequent tendency to become angry on the road. Driving aggression and driving anger are said to be related to each other, and both of these factors increase accident risk (Bogdan et al., 2016; Zhang & Chan, 2016). For the purpose of this study, the concept of trait driving anger will be used.

Because human beings are so complex, it is impossible to attribute a specific cause or reason to their various behavioural responses to traffic situations. It is said that higher levels of driving anger are provoked by higher level individual functioning, such as self-awareness (of personal skill), self-control and self-evaluation; high-level driving anger is especially related to accident involvement and risk (Roidl, Frehse & Hoger, 2014).

Learning and memory have been determined as factors that could drive an individual's behaviour, whether it is behind the wheel of a car or in the company of other people. The way in which you learn and what you learn forms part of the base of your being. Being taught how to drive a car could have a permanent effect on the probability to become angry on the road (Bucchi et al., 2012). If the manner in which a person teaches an individual to drive is aggressive, it is said that the learner builds up his/her own experiences of this aggression and believes that this is the norm in society. The driver then takes what has been learned, reorganises it in his own mind and adapts it to the environment (Bucchi et al., 2012). Learned driving behaviour could also extend to the professional environment, causing a professional driver to behave in a certain manner.

When learning by imitation, the driver could observe the endless forms of behaviour that he experiences on the roads, and makes them his own. It is important for learning to be understood as a sort of foundation for future behaviour. Any of these forms of learning guide the behaviour of every individual and, for this reason, it could be linked to driving behaviour. The model of driving behaviour displayed by parents is another form of learning. The manner in which parents conduct themselves in driving situations, as well their involvement in traffic violations, increases the likelihood of their children acting in a similar manner (Traubman-Ben-Ari, 2016).

Memory can be tied together with learning, as one remembers what one has learned previously. Information and situations are seen and stored in the brain. This allows the person to develop a response based on the outcomes that have been stored in his/her memory. Aspects of the

environment could be remembered as areas of caution, or areas where it is 'possible' to express driving anger (Bucchi et al., 2012). When individuals are familiar with their environment, they also tend to become more territorial about their surroundings. When an environment is travelled for the first time, fewer risks are taken, and therefore anger is minimised (Bucchi et al., 2012).

The amount of driving that a person does also tends to affect the way in which people react on the roads (as mentioned above regarding professional drivers). It has been determined that the longer and further an individual drives, the more frustrated and angry he or she gets (Deffenbacher et al., 2002). When someone has been behind the wheel for long hours, their patience tends to run out and the easier they become angry with other drivers and the environment in which they are driving.

Research has also investigated the effect that a fixed destination would have on driving behaviour. When an individual has a set destination to reach, the chances that they are angry are less. When the driver gets behind the wheel for no reason, there is more risk taking on the road; this is known to happen in youngsters who drive just for fun (Chliaoutakis et al., 2002). This is also when impulsive behaviours occur, and unplanned, dangerous actions are performed. This behaviour is also related to boredom, as the driver has nothing better to do but to seek out thrilling 'adventures' to cure the feeling of boredom.

Poor self-esteem has been investigated in order to determine if it has anything to do with driving anger and other driving behaviours (Traubman-Ben-Ari & Yehiel, 2012). Extensive research is still needed to determine whether this is a major contributing factor; however, the study that has brought this element to light has revealed that it does, in fact, play a role in a driver's behaviour. It has been stated that those with low self-esteem try to use their vehicles to eliminate any insecurities they may have (Chliaoutakis et al., 2002). For example, male drivers would make use of their cars in certain ways in order to 'prove to the world' that they are capable of being real men.

Regarding self-esteem, individuals who act out in anger also do this because they struggle with low self-esteem or self-dislike; this idea has been lingering for many years, but only minimal research has been conducted in order to expand it. The thought behind this is that most individuals who have low self-esteem put others down in an attempt to better their problem. It could also be attributed to the fact that these people feel satisfied if they cause others' self-loathing (Edwards, Warren, Tubré, Zyphur & Hoffner-Prillaman, 2013).

In order to restore the gap in the lack of research and empirical evidence on the topic of self-esteem, a more novel idea could be investigated, namely the threatened ego. It is said that those individuals with high self-esteem but who are unstable are more likely to have decreased levels of self-esteem within situations where the ego is threatened. Therefore, when these individuals are in a situation where their egos could possibly be threatened, they are more likely to respond in an aggressive way toward the source of the threat; the aggressive act is seen as punishment of the source (Edwards et al., 2013).

As mentioned above, there are countless individual characteristics that can influence driving anger. These factors are acknowledged and taken into consideration when making recommendations for future research. It was mentioned in Chapter 1 that the aim of the literature review is to investigate the possible causes of driving anger, and to use these factors to suggest implications for professional drivers in industry. For this purpose, the next section will discuss and present professional drivers in the context of driving anger.

2.3 PROFESSIONAL DRIVERS AND DRIVING ANGER

Road traffic has affected the development of civilisation (Zivkovic, Nikolic & Markic, 2015), assisting work processes and the development of infrastructure, etc. It is said that the level of development and safety is measured by the level of road traffic safety. As society and transportation develops, a network of roads has to be created and improved. However, with the increase in roads and infrastructure, risks and hazards have escalated. Every society has the responsibility to maintain and develop safety strategies as infrastructure increases; human safety as well as natural and material goods need to be protected (Zivkovic et al., 2015).

Research suggests that traffic accidents are caused by a series of situational and individual variables; situational variables are subjective factors (e.g. technical infrastructure, the impact of roads, social norms, and characteristics of the vehicle), and individual variables are objective factors (e.g. level of driving ability, personal characteristics, level of social maturity, etc.). In order to ensure an effective safety system, society must determine boundaries for unfavourable subjective and objective factors that create hazardous situations (Zivkovic et al., 2015).

The aspect of professional drivers has been mentioned previously; professional drivers are those road users who drive for organisational and income purposes. Companies need these drivers for

operational and objective income reasons. The quality of professional drivers' behaviours is based on the balance between the objective and subjective factors mentioned above. Subjective factors involved in traffic safety are aspects such as work experience and organisational culture (Zivkovic et al., 2015).

Professional drivers are at high risk for road accidents due to their excessive use of the roads (Öz, Özkan & Lajunen, 2010; 2014). According to various studies, professional drivers have an increased risk for road fatalities; even light transport vehicles are more likely to be involved in road accidents when compared to passenger vehicles (Mallia, Lazuras, Violani & Lucidi, 2015). A possible reason is that professional drivers' annual road mileage is greater than that of the average driver. Professional drivers are also said to have pre-determined tasks and therefore need to satisfy the demands of the company, whereas non-professional drivers can pace their driving and are not under pressure to reach demands expected from them. According to research, roughly 25% of work-related accidents in the USA are road accidents (Öz et al., 2010). A way in which these accidents could be addressed in the future is through the improvement of working conditions, working shifts, experience of vehicle use within the working environment, speed choice, etc. (Mallia et al., 2015).

Cognitive stress is said to result in two outcomes, namely subjective or emotional outcomes (like anger) and performance or consequential outcomes (like aggressive driving) (Öz et al., 2010). Considering cognitive stress and driving, a link has been found between professional drivers' life stress and accident involvement. Life stress has also been found to inflate as work stress increases. Therefore, there could be an indirect link between work stress and driving behaviour/accident involvement (Öz et al., 2010).

A study conducted on the driving behaviours of professional and non-professional drivers indicated that non-professional drivers display faster driving speeds (Öz et al., 2010). This may be true for professional drivers who transport citizens as well as goods; the vehicles they use to transport people (for example buses, heavy duty vehicles taxis, etc.) are much slower than those of non-professional drivers. Therefore, the type of vehicle that professional drivers operate may influence their driving behaviour. On the other hand, various companies have time schedules to which professional drivers need to adhere. If they predict that they may not meet these time

schedules, they may increase speed and reckless tendencies in order to avoid negative consequences (Öz et al., 2010).

Further studies have determined that different personality attributes between professional and non-professional drivers play an important role in determining reasons for traffic accidents. A high-risk personality is associated with careless driving, as well as speeding (Mallia et al., 2015). Other factors found amongst professional drivers causing traffic accidents are anxiety, hostility, depression and psychoticism. Furthermore, excitement-seeking factors were found to directly influence aggressive driving and speeding (Mallia et al., 2015).

Regarding fatigue in drivers, professional drivers were found to experience more fatigue due to long hours on the road (Öz et al., 2010). Compared to non-professional drivers, this difference is quite significant; non-professional drivers reported much lower fatigue levels on the roads. A study investigating stress in professional drivers came to similar findings. Because companies have rules and regulations that professional drivers need to follow, stress levels are far higher than the stress levels of non-professional drivers (Öz et al., 2010).

Therefore, research findings have confirmed that, for successful and safe vehicle operation, professional drivers should conduct themselves successfully; hence, appropriate personality traits and the professional selection of drivers are important (Zivkovic et al., 2015). The age of professional drivers has also been found to affect driving behaviours; risky driving behaviours were found amongst young professional drivers (Mallia et al., 2015).

Professional drivers should be employed according to their ability to drive safely and to follow rules and regulations ethically. These factors highlight the importance of personality in job performance, as committing violations on the road is an indication of counterproductive behaviour, as well as poor work performance (Mallia et al., 2015). Such drivers adhere to organisational and legislative traffic rules (Öz et al., 2014; Zivkovic et al., 2015).

Furthermore, professional drivers should be trained and educated in order to minimise traffic risks; both repressive measures and preventative measures should be developed. As a preventative measure, educating professional drivers on road safety is of great importance in determining their driving behaviour. Furthermore, organisations play a significant role in the shaping of work environments that encourage safe road traffic behaviours and positive personality traits (Zivkovic

et al., 2015). Öz et al. (2014) suggest that there is a relationship between organisational culture and job performance; hence, an organisational safety climate is necessary in the context of driving behaviours in traffic settings.

It is clear that the work context of a professional driver is complex. There are countless variables that could influence their driving behaviours (in this case their tendency to experience driving anger) within an organisational context. Specific latent variables have been suggested to affect both professional and non-professional drivers. The next section will discuss dependent variables and relevant antecedents influencing driving anger in the non-professional and professional driver context.

2.4 RELEVANT LATENT VARIABLES

2.4.1 Personality

When considering the ‘makeup’ of various individuals, not one person has the same personality factors as another. This makes aspects such as understanding and communicating with others very difficult. To avoid everyday conflict, we either need to accept that people differ or we need to know the individual whom we are interacting with quite well. This could help us predict various responses in various situations. On the roads, we are constantly dealing with varieties of personality types and, where miscommunications are difficult to clear up, conflict is bound to occur. Regrettably, there are many aspects of the personality that could cause someone to express driving anger in this way. This then leads to problems such as accidents, injuries and even deaths.

The concept of anger and related constructs, like aggression, has been a topic of interest in the behavioural sciences (Pease & Lewis, 2015). Research has determined the situational, cognitive and dispositional causes of emotional anger. Recently, the interest in personality and the role that it plays in anger has increased. However, anger, and especially driving anger, is a complex concept (Pease & Lewis, 2015), and limited research has been done to identify the extent to which personality plays a role in road rage. However, the studies that have been completed on this subject have identified evidence that supports the relationship. If not directly, there undoubtedly is an indirect link to anger on the roads and certain personality attributes. Guo, Wei, Liao and Chu (2016) suggest that there is a clear relationship between personality traits and accidents; they state that the influence of personality on driving behaviours has been found to be consistent in driving

contexts and that personality can predict both driving behaviours as well as accident involvement (Guo et al., 2016).

The Big Five personality factors are the dimension that has been utilised the most in order to determine the effect of personality on driving anger and driving styles (Traubman-Ben-Ari & Yehiel, 2012). Each of the five factors can be investigated as a single element, which can shed light on the major components of our personalities and how this affects driving behaviours. This five-factor model is derived empirically and is based on the personality traits embedded within an individual; the terms used in this model are found in natural language. These personality factors are the broad domains of one's personality. These broad personality traits could influence the tendency to engage in angry behaviours on the road, which also has a direct influence on driving performance (Dahlen et al., 2012; Guo et al., 2016; Traubman-Ben-Ari & Yehiel, 2012).

Efforts to categorise the concept of personality started after William McDougall stated that personality may be broadly separated into and analysed as five separate factors, namely temper, disposition, temperament, character and intellect (Hunter, 2014). Years after this, Raymond Cattell researched and developed an instrument consisting of sixteen primary factors and eight second-order factors. Thereafter, in 1961, Ernest Tupes and Raymond Christal established considerable support for five factors, namely emotional stability, agreeableness, culture, assurgency and dependability (Hunter, 2014). A vast amount of literature has accumulated since the development of these five factors, providing evidence of the robustness of the five-factor model; research also shows that the five-factor model is independent of cognitive ability measures (Hunter, 2014).

These five factors have become known as the Big Five Personality Factors. Each of the five factors comprises groups of personality traits that correlate closely with one another (Hunter, 2014). The Big Five Personality Factors are extraversion, emotional stability, agreeableness, conscientiousness, and openness to experience. Research shows that these five factors are compatible across various cultural and national groups (Hunter, 2014).

An alternative model to the Big Five model has recently come to light, namely the HEXACO model. With very little research, it is worth mentioning that this six-dimensional model is highly consistent across various cultures. The factors that it contains are: Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C) and, finally, Openness to Experience (O). Because of the difference in length and factors, the HEXACO model

explains various personality phenomena that are not described or explained by the Big Five model (Ashton & Lee, 2007; Fouche, 2015).

The HEXACO makes many accommodations for the variables that were poorly incorporated in the Big Five model. In addition, this alternative model consists of constructs that illustrate reciprocal and relational altruism, as well as the differences in these mannerisms; it also identifies the patterns of gender differences in personality characteristics. It should, however, be emphasised that the HEXACO is not a result of the expanding of personality as a definition. It is also not an outcome due to any changes in the way in which personality is examined; instead, the information for this model emerged during the same investigations employed as a strategy in the selection and measuring of the Big Five variables (Ashton & Lee, 2007).

Emotionality replaces Emotional Instability (or, as called in this research study, Neuroticism), and Honesty-Humility is the additional variable in the HEXACO. Emotionality is said to be less derogative than the term Neuroticism. Honesty-Humility consists of characteristics such as sincerity, fairness, greed avoidance and modesty (Ashton & Lee, 2007; Fouche, 2015). Ashton and Lee (2007) also state that an advantage of this model is that it is based on cross-cultural findings that are representative of personality as a domain.

Weller and Thulin (2012) have said that Honesty-Humility symbolises the propensity to act in a fair and genuine manner when dealing with others. Individuals low on Honesty-Humility have been associated with multiple risk-taking behaviours. These individuals are also highly sensitive to rewards; they would use any advantage possible in order to obtain a reward. In addition, those low on Honesty-Humility have been related to bigger perceived benefits when engaging in risky behaviours; they also perceive the risk to be lower in their behaviours (Weller & Thulin, 2012).

Extraversion, Openness to Experience and Agreeableness, nonetheless, are defined in the same manner as in the Big Five model. These definitions are explained further in the next section. Unfortunately, very little research has been conducted on the HEXACO model, with poor correlations with various concepts; therefore the Big Five model was used to link personality to driving anger on the roads. Because of the extensive research, the Big Five personality factors are more valuable when measuring a novel concept such as Traffic Psychology.

An additional personality theory is that of the dark triad. The dark triad consists of three unpleasant personality factors, namely narcissism, Machiavellianism and psychopathy (Jakobwitz & Egan, 2006; Jonason, Zeigler-Hill & Okan, 2017). Narcissism has to do with an individual's self-love, as well as infatuation with one's self. Machiavellianism deals with strategies that support self-interest, deception and manipulation; these individuals are said to manipulate social and interpersonal interactions (Jakobwitz & Egan, 2006). Finally, psychopathy refers to remorselessness, selfishness and lack of internal affect, with an anti-social lifestyle. Studies show that various Big Five factors correlate with the dark triad factors. For example, neuroticism is said to correlate positively with psychopathy and negatively with conscientiousness, and agreeableness was found to correlate with all three factors. In contrast, openness and extraversion had no significant correlation with the dark triad factors (Jakobwitz & Egan, 2006).

Given that it is “your average person” who operates behind the wheel, the general makeup of these drivers could be defined using the Big Five factors. The dark triad consists of unpleasant personality aspects, and experiencing driving anger might not be simply because of these negative personality traits. Just because someone is angry on the road does not mean that he/she may have narcissistic traits. The dark triad also functions more in the psychodynamic field and, as mentioned, most road users are everyday “average” drivers.

a) Agreeableness

Agreeableness refers to someone being trusting, cooperative and good-natured (Dahlen et al., 2012). It is also associated with the ability to be flexible, courteous and tolerant. Dahlen et al. (2012) say that agreeableness is related mostly to maintaining positive interpersonal relations with others. Those who are low on agreeableness tend to be volatile, ill-tempered and quarrelsome and are likely to resent those who have harmed them. Those who are higher in this trait tend to forgive easier. Individuals high in agreeableness are likely to be gentle and compassionate when communicating with others (Brink, 2014). Those who are high in agreeableness tend to compromise and liaise with other individuals and have a higher threshold regarding anger (Brink, 2014).

Individuals who have low levels of agreeableness are usually seen as unfriendly drivers, and also display aspects of irritability and rudeness; this dominates their behaviour when they are operating

in certain situations. Further research proves that agreeableness is correlated inversely with traffic violations and driving aggression (Guo et al., 2016; Pease & Lewis, 2015).

b) Conscientiousness

Conscientiousness is one of the more popular attributes studied in the subject of traffic psychology (Jovanovića, Lipovac, Stanojević & Stanojević, 2011). Conscientiousness generally refers to thoughtfulness, dependability and responsibility, organisation, caution, etc. (Brink, 2014). Those individuals who are conscientious are also said to be careful, hard workers and are concerned with general safety. Those high in conscientiousness tend to have a preference for order and structured procedures; these individuals tend to exert high levels of effort. Those who are low on conscientiousness tend to be negligent, make errors and are likely to act on impulse.

Research has identified that conscientiousness is negatively related to reported car accidents (Guo et al., 2016). There is also evidence that indicates that thoroughness is an underlying variable within conscientiousness (Dahlen et al., 2012; Pease & Lewis, 2015).

c) Neuroticism

Neuroticism is associated with being angry, anxious and quick to feel upset (Kwantes, Derbentseva, Lam, Vartanian & Marmurek, 2016). It is part of emotional stability. Emotional stability is the personality dimension that is associated directly with an individual's adjustment to situations and affect (feelings). Individuals with low emotional stability are seen as neurotic. Emotional stability refers to the ability to be even-tempered, composed under stress and resilient (Dahlen et al., 2012). Those who are high on neuroticism tend to use more negative emotion words to express themselves than those low on neuroticism. Research shows that other traits associated with neuroticism are likely to be tense, restless, irritable, uneasy, moody, etc. (Kwantes et al., 2016). It has also been suggested that neuroticism is a cause of mental illnesses, dissatisfaction as well as driver stress; it has therefore been proven that neuroticism correlates positively with risky driving and road accidents (Guo et al., 2016).

d) Openness to experience

Openness to experience comprises traits like culture, curiosity, broad-mindedness and intelligence. Intellect or imagination incorporates elements such as innovation and creativity; intellect includes factors such as curiosity, inquisitiveness and mental ability (Brink, 2014). Individuals who are

high on openness to experience are able to accept the unfamiliar and are open to ideas that tend to be drastic and perceived as eccentric. Those who are low on openness to experience avoid strange or nonconforming individuals (Brink, 2014).

Even though this is the trait that has received the least amount of attention with regard to driving behaviours, it could still be utilised in some way when determining driving behaviours (Dahlen et al., 2012; Guo et al., 2016; Pease & Lewis, 2015).

e) Extraversion

Extraversion is marked by sociability, impulsiveness and assertiveness. Sociability comprises the inclination to prefer social situations, with sociable people drawing energy from the people around them. Extraverted individuals tend to be comfortable around people, interacting with liveliness, energy and passion. People who are higher in extraversion tend to be more exuberant and loud (Brink, 2014).

Research has shown that there is a positive relationship between extraversion and traffic-related fatalities and motor vehicle accidents (Dahlen et al., 2012; Guo et al., 2016; Pease & Lewis, 2015). It has also been determined that extraverted individuals tend to be involved in situations where violations and errors have occurred. An individual who is an extravert has outgoing qualities, as well as elements of a need for activity. This therefore can be related to driving behaviour, where extraverted drivers make decisions based on impulse. It has been stated that many negative driving behaviours are based on impulsive behaviour in the road user (Dahlen et al., 2012).

There are other personality attributes that affect the tendency to become angry on the roads. In spite of these, the researcher cannot hypothesise on all of the possible personality factors that are related to driving anger; the list would be endless. The researcher could, however, acknowledge some outstanding factors.

Information processing refers to how one interprets and explains various occurrences. The manner in which we interpret situations on the road is influenced by what is called a hostile attribute (Yagil, 2001). Yagil (2001) has also determined that, if an individual is known to have the attribute of hostile intentions, he would most likely be angry and would respond in a more aggressive fashion to provoking circumstances. An increase in feelings of frustration is also bound to occur if the individual has hostile attributes.

When interpreting other drivers' behaviour, one could either perceive it as unintentional, or it could be perceived as deliberate (Yagil, 2001). As mentioned before, when a driver is frustrated and when the act of another driver is interpreted as deliberate, the likelihood of experiencing driving anger inside the vehicle or outside the vehicle increases.

Driving mood is another example. Many individuals see driving as a competition. They feel that it is a way of showing power and dominance (Yagil, 2001). When this is part of one's mood, it could be permanent or it could be a once-off occurrence. The use of a vehicle to simply get from one place to the next falls away and the tendency to use it as a tool instead becomes evident. Yagil (2001) states that there is a positive relationship between dominance and risky driving behaviours.

Sensation seeking is the final personal attribute that could be considered when investigating the driving anger of road users. This factor refers to the need for novel, complex and extreme sensations. Financial, social and legal risks are usually taken in order to experience these feelings (Dahlen & White, 2006). Drivers take part in dangerous acts that could risk their lives and the lives of fellow road users in order to feel the 'rush' and adrenalin that they desire. When individuals have high sensation-seeking tendencies, these will be related to greater occurrences of speeding and traffic accidents (Dahlen & White, 2006). Therefore, reckless driving, as well as angry driving behaviours, could be expected from these individuals.

It is important to note that most of these personality attributes do not lead directly to traffic accidents, but rather indirectly. The reason for this is that personality affects behaviour, and behaviour leads to possible consequences, like accidents (Constantinou, Panayiotou, Konstantinou, Loutsiou-Ladd & Kapardis, 2011).

Linked to personality is emotional intelligence, which has also been debated through the years. Emotional intelligence as a factor in traffic psychology will be discussed in the next section.

2.4.2 Emotional intelligence

The theory of emotional intelligence extends from the traditional measure of rational thinking and the effect of rational thinking on success; the study of logical thinking and emotion is said to lead to rational thinking and decision making (Du Plessis, 2014; Van der Nest, 2010). This has propelled interest in the construct, ahead of the development of measurement reliability and validity, hence emotional intelligence was initially criticised for lacking concrete models and

measures. The basis of emotional intelligence extends from social intelligence, a concept coined by Edward Thorndike. He stated that social intelligence is the ability to perceive and understand one's own, as well as others', internal motives and behavioural tendencies, and to act accordingly (Du Plessis, 2014; Van der Nest, 2010).

Emotional intelligence, explained theoretically by Peter Salovey and John D. Mayer in 1990, is a theoretical model that postulates that emotional intelligence is a cognitive process of monitoring emotions of the self and of others and discriminating between these emotions for problem-solving purposes (Du Plessis, 2014; Van der Nest, 2010). Peter Salovey and John Mayer further stated that emotional intelligence consists of four categories, namely perception, appraisal and expression of emotion (verbal and non-verbal); thinking driven by emotions; understanding, analysing and employing emotional knowledge (regulation of emotions in self and others); and reflective regulation of emotions necessary to promote emotional and intellectual growth (utilisation of emotions in problem solving through creative thinking, flexibility, planning, etc.) (Schutte, Malouff, Hall, Haggerty, Cooper, Golden & Dornheim, 1998; Van der Zee, Thijs & Schakel, 2002).

Goleman's book on emotional intelligence created even more interest in the study of emotional intelligence. He states that emotional intelligence consists of four elements of cognitive abilities, namely self-awareness, self-management, social awareness and relationship management (Schutte et al., 1998; Van der Zee et al., 2002). According to Goleman, the definition of emotional intelligence would include the ability to perceive and regulate not only one's own emotions, but the emotions of others too (Du Plessis, 2014; Van der Nest, 2010). Furthermore, Goleman suggests that success is driven by emotional intelligence, more so than by cognitive ability (Van der Nest, 2010).

Because emotions consist of a number of components, so does emotional intelligence comprise a number of interrelated skills. As mentioned, emotional intelligence has been defined as the ability to perceive, understand and manage emotions in order to facilitate thinking and behavioural patterns (Sharma, Deller, Biswal & Mandal, 2009). Utilising an ability measure is said to determine the level of emotional intelligence embedded within the individual. Emotional intelligence includes feelings of empathy towards others (putting yourself in their shoes), and also relates to recognising how others are reacting towards you (Yukl, 2013).

Self-regulation is another aspect of emotional intelligence. This relates to the ability one has to channel the correct emotion into the most suitable behaviour and in the most appropriate situation; the focus here is not to react on impulse, but rather to display the most fitting behaviour for the specific situation (Yukl, 2013).

Self-regulation is particularly interesting when considering traffic psychology. Those who possess the ability to regulate their own behaviour whilst on the road may be expected to drive in a safe and socially acceptable manner. The question is whether or not anger on the roads could be self-regulated by using emotion as an ability. The aim therefore should be to determine whether a relationship exists between driving behaviour and emotional intelligence.

Emotional self-awareness and communication are two concepts that also concern themselves with emotional intelligence (Yukl, 2013). Self-awareness of one's emotions is associated with recognising your moods and emotions and how these change over time; once again we question whether drivers who are aware of their emotions are more inclined to remain calm in aggravating situations. Emotional intelligence is not a static concept; it can be learned. However, only extreme levels of individual coaching and individual motivation will lead to considerable improvement (Yukl, 2013).

Research has shown that emotional intelligence is the ability to reason about emotions in order to develop one's thinking patterns (Sadri, 2012). Most of the definitions that have been developed for emotional intelligence focus on the thought processes and behaviours of the individual. It has also been stated that our capabilities of perceiving and generating emotions assist us during thought. An individual who possesses emotional intelligence is one who understands and has knowledge about emotions (Sadri, 2012).

These theorists have developed a model, called the Emotional intelligence theoretical model (Figure 2.1.), that considers four levels of abilities (Sadri, 2012). The most fundamental level is the capability to perceive emotions displayed by other individuals (understanding and identifying facial expression is a component of this ability level). Even though there is limited communication between drivers whilst in their cars, it has been stated previously that anger on the roads is a form of communication; a specific thinking pattern is established as individuals express anger on the roads. Facial expressions would not be relevant in the context of traffic psychology; however, this could change once physical aggression (like getting out of the car to hurt another driver) is

displayed. The second ability level refers to the capability to use one's emotions to assist thought processes (Sadri, 2012). This is done by comparing various emotions and determining what the most applicable emotion is (Sadri, 2012).

Understanding emotions is the third level; this encompasses the classification of emotions and the comprehending of relationships in which changes in emotions occur (Sadri, 2012). Finally, the fourth level relates to the controlling of one's emotions in order to master the effective management of feelings (Sadri, 2012). Weinberger (2009) has determined that the key assumption underlying the definition is the connection between emotions and intellect. The ability to perceive, express and regulate emotions is for the purpose of emotional and intellectual growth within an individual (Weinberger, 2009).

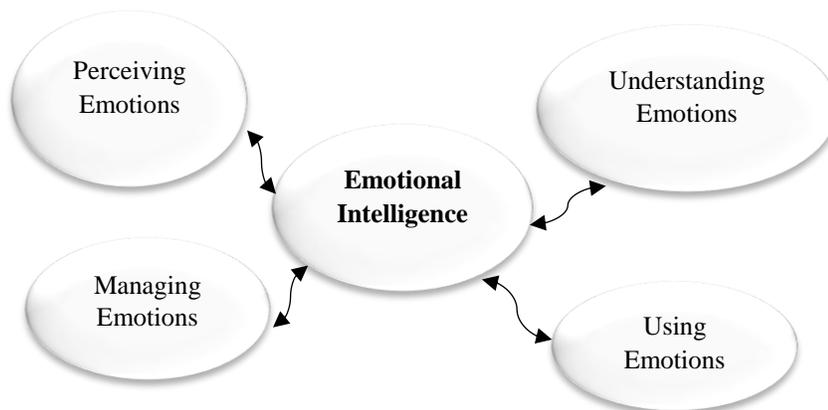


Figure 2.1. Emotional intelligence theoretical model

It has been observed on a continuous basis that there are two diverging perspectives when defining emotional intelligence; these perspectives are trait focused and cognitively focused respectively. Both of these are said to be components of emotional intelligence, and therefore form groups within this concept (Weinberger, 2009). The trait-focused perspective considers self-observed abilities and personality traits. The cognitive perspective appears to contain skills of emotional intelligence that could be measured and identified by behaviour components (Weinberger, 2009).

One major criticism of emotional intelligence is the fact that very little empirical research has been conducted on the validity, reliability and, finally, the measurement of this construct (Chopra &

Kanji, 2010); it lacks scientific bases. Furthermore, because of the extent of research conducted on emotional intelligence itself, more turmoil has been created than clarification (Chopra & Kanji, 2010). It is now the case where self-reported measures of emotional intelligence are believed to be less meaningful than performance-based measures. Abilities and skills are measured directly by using specific situations that are supposed to reflect specific emotional intelligence skills (Chopra & Kanji, 2010).

Emotional intelligence is not simply a unidimensional construct, but is multidimensional in nature; it includes inner as well as outer emotional intelligences. It also comprises talents, learned abilities, socio-economic factors and, finally, relationship-managing capabilities. Consequently, using these factors one could successfully grasp the emotions of one's self and the emotional activities of others that are needed for adjusting to every situation (Chopra & Kanji, 2010). As mentioned before, situations and environments are changing constantly, and being able to adjust to these situations could have a possible impact on driving behaviour and emotions.

2.4.3 Gender

There are many differences that can be acknowledged between males and females around the world. For example, the way they dress, the way in which they talk, their interests and hobbies, the manner in which they communicate, etc. Considering differences in traffic psychology, there are distinct differences between the driving behaviours of males and the driving behaviours of females. Several studies have proven that the mortality rate of male drivers is greater when compared to female drivers (Jimenez-Mejias et al., 2014). Furthermore, surveys conducted by the Traffic Department in Spain indicated that men not only receive more traffic fines than women, but they also place less importance on risky driving behaviours. This study and similar research has concluded that males view accidents as an insignificant problem and therefore have a greater involvement in accidents (González-Iglesias, Gómez-Fraguela & Luengo-Martín, 2012; Jimenez-Mejias et. al., 2014).

A novel term has been used for the behaviours that men tend to acquire, and that is the idea of a 'macho' personality or behaviour. Men who feel that they are more powerful and manly are inclined to transfer this type of behaviour to the road; this personality style is then converted into driving anger (Özkan & Lajunen, 2005). However, this does not always succeed in explaining males' tendency to drive in a more risky fashion than women. It has been determined, through

various studies, that male drivers are more risky on the roads in the sense that they less frequently make use of a safety belt, they drive at faster speeds, take part in reckless driving, and more frequently engage in traffic violations (Özkan & Lajunen, 2005); this is the extent to which clear differences can be seen between males and females on the roads.

Other than individual differences between males and females, a potential reason for variations in driving behaviours is because of the children who are usually with females. This decreases the risks that woman are willing to take to protect these minors. It also affects the way in which they drive, by minimising factors such as speeding and driving close to the back of another vehicle (Özkan et al., 2005). It has also been determined that males are on the roads more than females (González-Iglesias et al., 2012). They are therefore exposed to increased traffic situations that can affect driving behaviour.

Further research has stated that males are twice as likely (compared to females) to be involved in fatal traffic accidents; this may be attributed to rule violation, as males show less motivation than females to comply with traffic rules and legislation (Degraeve, Granie, Pravossoudovitch & Monaco, 2015). Nonetheless, females are still viewed as poor drivers; this may extend from stereotypes held about male and female drivers. According to research, the negative stereotype is still evident where females are viewed as drivers who cannot handle stressful traffic situations. Because of their emotional sensitivity and vulnerability they are not able to make effective, rapid decisions (Degraeve et al., 2015). These negative stereotypes have the potential to impact both male and female driving behaviours; for example, negative stereotypes may impair driving performance in females who are aware of these stereotypes (Degraeve et al., 2015).

Further stereotypes entail that female drivers are seen as incompetent, cautious drivers, whereas male drivers are seen as careless yet skilled. Females are known to have safety abilities but poor driving skills, compared to males, who have driving skills but disregard safety (Degraeve et al., 2015). If female drivers are involved in traffic accidents, it is attributed to a lack of vehicle mastery. In the event that male drivers are involved in traffic accidents, it is seen as a possible disregard of fellow road users. Conversely, where females successfully avoid traffic accidents it is attributed to cautious and vigilant driving. Male drivers who successfully avoid traffic accidents are seen as having good driving skills and agility (Degraeve et al., 2015). These stereotypes can be described using the concepts of masculinity and feminism within society.

Even though there are distinct differences between male and females tendencies to express driving anger, it is important to use both gender and age in conjunction. The section to follow discusses age and its role in the driving environment.

2.4.4 Age

Young (novice) drivers are increasingly involved in fatal road accidents, as well as injuries related to traffic accidents. One of the most risky behaviours that cause these occurrences is speeding. Young drivers are naïve regarding the consequences thereof and therefore underestimate the dangers of speeding. Inexperience can also be attributed to accidents as a result of speed. These young individuals are not equipped with sufficient knowledge to respond to road hazards in time (Scott-Parker, Hyde, Watson & King, 2013).

Although most individuals who make use of the roads understand many of the risks involved when driving, not all of them believe that these risks apply to them. In other words, most people believe that they are immune to danger on the roads and feel that if something serious would happen while driving, it would not happen to them (DeJoy, 1992). This naivety is particularly evident amongst young adults. Their inexperience tends to disappoint them, as research has shown that the main factor that puts them at risk is their over-estimation of their driving skills and abilities. They usually drive lower quality cars and underestimate danger that could occur, putting them at risk on the roads worldwide (Constantinou et al., 2011).

It has been revealed that male teenage drivers have the highest number of crash-related accidents than any other age group, and young drivers between the ages of sixteen and seventeen years of age have higher crash-related statistics than other, older adolescent groups (Constantinou et al., 2011; Lambert-Bélanger, Dubois, Weaver, Mullen & Bédard, 2012). A different method of studying crash involvement is focusing on the impact that passengers have on drivers. Passengers could easily affect what individuals do on the roads by distracting the driver, telling him/her how to operate on the road, cause loss of attention and focus in the individual driving, etc. Lambert-Bélanger et al. (2012) have researched the effect that passengers have on drivers. They found that crash-related incidents are higher when passengers are in the car, and that the statistics for road accidents increase with an increase in passengers. They say that this is a different way to look at age and driving behaviour, where the exposure of passengers affects teenage drivers.

Extreme optimism has also been used to explain the disproportionate involvement of young males in road accidents. It has been determined that young adults have much higher optimism compared to older drivers. This allows these young individuals to perceive many situations and driving behaviours as less risky (DeJoy, 1992).

The above-mentioned factors are suggested to influence driving anger (either directly or indirectly), which is therefore the dependent variable in this study. The next section will discuss driving anger as a variable in the current study.

2.4.5 Driving anger

Based on the research question, driving anger is assumed to be a “product” of driver characteristics influenced by other external and internal traffic safety factors, i.e. various individual characteristics could be linked directly to individual driving styles, making each individual unique in the way that they drive. Furthermore, it is assumed that drivers’ traits and emotions determine their driving styles in various situations (Bogdan et al., 2016; Roidl et al., 2014).

A survey undertaken by ‘The AA of South Africa’ has identified concerning statistics on road rage on South African roads (Sukhai, 2003). The study included more than 1 000 experienced drivers. The questionnaire used four subscales, namely (1) mild aggression (verbal, non-threatening), (2) verbal/expressive anger (directed towards other drivers), (3) threatening/intimidating aggression, and (4) loss of control (pre-meditated behaviour). The report concluded that, of the respondents who completed the questionnaire, 10% reported that they had experienced anger in the form of pre-meditated behaviour, and 87% had experienced anger in the form of mild aggression. It is also important to state that these respondents rated themselves as experienced drivers who spent many hours on the roads

The Australian Arrive Alive foundation found similar statistics; on average, 47% of drivers reported that there were children in the car during a road rage occurrence. In addition, only 1.1% of drivers admitted to assaulting another driver during a road rage incident (Bailey, Lennon & Watson, 2016). Finally, 3.4% of research participants indicated that they had been assaulted during a road rage confrontation. Extreme cases of driving aggression are rare, as drivers are generally more involved in milder forms of aggression, like yelling, honking of the horn, hand signals, etc. (Nesbit & Conger, 2012).

Although many countries have enforced laws regulating driving behaviours, there has been difficulty defining aggressive driving behaviours, thus preventing the ability to enforce the legislation necessary to minimise driving anger (Nesbit & Conger, 2012). Anger as an emotion has been linked to aggressive driving. This negative emotional experience is said to be provoked by contextual cues, leading to cognitive, behavioural and psychological responses (Nesbit & Conger, 2012). Hence, driving anger forms part of the broader concept of traffic psychology.

Traffic psychology is present worldwide; unfortunately there is a lack of research in this field. Transportation is seen as one of the greatest necessities for most of the population. Getting to and from work, school and various activities allows us to live our lives. People work for money to survive; in order for this to happen, most of them need to get to work. Vehicles (including cars, buses and taxis, etc.) are one of the most used methods of transportation and, as mentioned before, a variety of individuals operate these vehicles. Therefore, it could be said that there are endless amounts of causes and consequences that would lead to the violation and misuse of cars and other vehicles. The violation in question here is driving anger. In 2010, Spain recorded 85 503 road accidents in the country. This included 2 478 deaths and 120 345 injuries (González-Iglesias et al., 2012).

The aim of the literature review is to investigate the anger that drivers experience on the roads and, based on the findings, to identify and test prominent antecedents affecting driver behaviours on the roads, i.e. the extent to which individual characteristics influence driving behaviours. Driving anger amongst drivers could be caused by a great number of factors. For example, gender, age, personality attributes, emotions, moods, feelings of territoriality, etc. are all possible causes of driving anger. Autonomy has been assessed as a contributor to anger on the roads. Individuals feel most anger towards other drivers who block their way or inhibit their 'style' of driving, as they feel they cannot do on the roads as they please (Yagil, 2001).

Frustration has also been determined as one of the main factors that lead to the anger of drivers. This could arise from environmental frustrations, where the environment proves to be problematic and/or obstructing. A large amount of drivers' frustration is caused by other drivers and is based on how they interpret the behaviours of their fellow road users (Yagil, 2001). Unfortunately, there cannot be one specific source of these feelings of anger, and we therefore need to determine which factors are the major contributors to this dependent variable.

The tendency to become angry is referred to as trait driving anger (Ge, Zhang, Zhang, Zhao, Yu, Zhang, & Qu, 2016). Trait driving anger has recently been under discussion and is now viewed as one of the biggest determinants of angry driving behaviours. This trait is measured with the Driving Anger Scale (DAS) measurement scale, which is discussed (in detail) in Chapter 3. The definition of trait driving anger is “the extent to which drivers chronically become angry behind the wheel” (Blankenship & Nesbit, 2013, p.135). This means that individuals who have high scores on trait driving anger are likely to experience anger behind the wheel at a higher and more frequent rate. These individuals are compared to those who have low scores relating to trait driving anger, where such an individual would be more patient and have a lower intensity and frequency of being provoked to anger (Hill, Stephens & Sullman, 2016).

Even when both of these scorers (high and low) drive the same number of times for the same distances, higher scoring individuals would still experience anger more frequently (Blankenship & Nesbit, 2013). Based on an individual’s traits, driving behaviours are said to be outcomes of present negative affective states. Blankenship and Nesbit (2013) say that how the driver reacts to these negative states depends on what is embedded within the person. They also state that these negative affective and emotional states are irritation, moods and, as recently mentioned, frustrations; this suggests that driving anger is relatively similar to daily forms of anger that the individual experiences. Emotions cannot be ignored in the study of driving anger, as they have been found to have a direct effect on aggressive driving behaviours (Hu, Xie & Li, 2013), as well as traffic accidents (Ge et al., 2016).

Traffic accidents are becoming more apparent in modern times. It is important to consider anger and emotions as causes of accidents, as they have the potential to lead to interventions that could be developed to decrease the extent to which individuals express anger on the roads.

2.4.6 Summary

This section has defined, discussed and motivated the relevant latent variables included and measured in the study of driving anger. The following discussion will focus on the relationships between the latent variables and driving anger, as well as the subsequent hypotheses.

2.5 RELATIONSHIPS BETWEEN LATENT VARIABLES

The relationships between the latent variables and the dependent variable will be discussed and motivated in this section. The latent variables were derived from various literature studies completed previously, as the aim was to identify and test prominent antecedents effecting driver behaviours, i.e. driving anger on the roads.

2.5.1 Personality attributes and driving anger

Driving anger is becoming an international problem. Not all individuals become angry while behind a steering wheel, but what differentiates one individual's behaviour from another? The answer is not a simple one, as situational and external factors play a critical role in everyday behaviour. Fortunately, we can attribute most of the outcomes of human behaviour to personality. These factors are embedded within all human beings; therefore, they can be used successfully in determining a specific type of behaviour, namely driving anger on the road.

It has been determined that, when an individual is a Type-A driving behavioural type, 'hard' driving and driving anger are evident (Miles & Johnson, 2003). Hard driving refers to the way an individual drives (e.g. speeding and taking dangerous chances), as well as what he or she believes is risky. A Type-A driver is also seen as competitive and has foundations of hostility, anger and a lack of patience. Researchers have determined that the degree to which these drivers have time urgency affects the degree to which they are impatient. They therefore state that this behavioural type increases the probability that these individuals would take part in angry driving behaviours.

When a driver is labelled as an angry driver, he or she shows very little concern for the safety of others. These drivers also lack care for the well-being of their fellow road users, as they generally focus on their own needs on the road. This could either be intentional or it could just be defined as carelessness (Miles & Johnson, 2003). Considering three of the five factors (agreeableness, conscientious, and neuroticism or emotional stability), we can 'assign' specific driving behaviours based on these dimensions. However, this is merely a prediction of how the individual is expected to behave on the roads.

As mentioned in the previous section, the Big Five have positive connotations and in that sense may be more beneficial than the HEXACO model when considering possible interventions. For example, if it is determined that extraversion increases tendencies to become angry, the respective

interventions could focus on redirecting this energy into a positive attitude rather than a negative attitude (positive psychology).

Another example would be if research shows that conscientiousness results in low anger on the roads, interventions could focus on teaching drivers to be more conscientious in the manner in which they drive; or if agreeableness is high, anger is low – interventions then could focus on teaching skills to become warmer towards others. The following section focuses on explaining the Five Factors included in the study of personality.

A substantial amount of research has been conducted on the relationships between driving behaviours and aspects such as demographics, cognitive functioning, performance, etc. However very little research has focused on the Big Five personality traits and their influence on driving behaviours (Parr, Ross, McManus, Bishop, Wittig, & Stavrinou, 2016). According to the Big Five model, individuals are positioned on a continuum for each of the five personality factors. Each of these factors can be divided into subgroups in the form of traits. Individuals who demonstrate high levels of each of the five traits will display certain subgroup traits. For example, individuals who are high on openness to experience may be characterised by fantasy, action and novel ideas (Parr et al., 2016).

a) Agreeableness

Agreeableness is said to reflect an individual's relationship with others, as well as attitude toward others. These individuals believe that if they help others and treat them with warmth, they will receive the same treatment in return (Jovanovića et al., 2011). Subgroup traits may be aspects such as trust, compliance, altruism, etc. (Parr et al., 2016; Traubman-Ben-Ari & Yehiel, 2012). Agreeableness has been attributed to the extent to which the individual is compliant with rules and regulations; research has found that this trait is inversely associated with accidents, law violations and loss of control of a vehicle (Dahlen et al., 2012; Guo et al., 2016; Parr et al., 2016).

Those who score low on agreeableness reflect egocentric, competitive, manipulative and antagonistic tendencies. Research shows that antagonistic individuals tend to be hostile in nature, with the need to punish or attack others (Jovanovića et al., 2011). Although low scorers can be connected to aggressive tendencies in general, there are a number of studies that have proved the relationship between low levels of agreeableness and driving-related aggression and rule violation

(Jovanovića et al., 2011). Hence, it is suggested that, when individuals have low levels of agreeableness, they tend to disregard the law and various rules (Miles & Johnson, 2003; Roidl et al., 2013).

An individual with high levels of agreeableness is less likely to express driving anger (even if provoked), as he/she wishes to enhance cooperation. Dahlen et al. (2012) indicate that they also generally contain their negative emotions. Parr et al. (2016) made similar findings and stated that those high on agreeableness are able to regulate their own behaviours and reflect feelings inward.

H₁ Agreeableness has a significant negative effect on driving anger.

b) Conscientiousness

Conscientiousness is defined as the degree of organisation, motivation and persistence of a specific behaviour directed at a goal (Jovanovića et al., 2011; Traubman-Ben-Ari & Yehiel, 2012). Conscientiousness includes aspects such as dutifulness, order, self-discipline, etc.; this trait is especially related to self-monitoring (Parr et al., 2016). In this case, if drivers contain low levels of conscientiousness, they would come across as rash, careless and also irresponsible (Miles & Johnson, 2003). Individuals who are conscientious tend to be more receptive to social norms; Jovanovića et al. (2011) support this notion and suggest that individuals who are high on conscientiousness are expected to observe and act according to traffic regulations. This is what would allow them to take part in less risky driving behaviours. They regulate their own behaviour to abide by these rules and norms (Dahlen et al., 2012; Guo et al., 2016; Parr et al., 2016).

This personality trait is negatively related to anger on the roads (Jovanovića et al., 2011), because these individuals are inclined to respond to the laws of the road. Therefore, as stated by Dahlen et al. (2012), those who have high levels of conscientiousness are said to engage in minimal risk taking and tend to avoid situations that involve danger; these individuals also adjust their own behaviour in order to keep to performance standards (Roidl et al., 2013).

H₂ Conscientiousness has a significant negative effect on driving anger.

c) Neuroticism

Neuroticism is defined as the inclination to experience difficulty in dealing with problems, as well as experiencing negative emotions. Those high on neuroticism are unable to deal with stresses effectively; these individuals are also prone to irrational thinking (Jovanovića et al., 2011).

Individuals with high neuroticism are said to be impatient, tense, anxious, irritable, hostile, impulsive, etc. (Miles & Johnson, 2003; Parr et al., 2016). These individuals evaluate situations as much more stressful than those who have high emotional stability (Guo et al., 2016). Those with low levels of emotional stability also have poor coping abilities, including unrealistic and impractical beliefs; these individuals are easily angered. Their insecurities will also tend to increase the risk of expressing driving anger while behind the wheel (Dahlen et al., 2012).

Research has proven that neuroticism is positively related to risky driving behaviours, aggressive behaviours, traffic accidents as well as morality rates (Jovanovića et al., 2011; Traubman-Ben-Ari & Yehiel, 2012). Furthermore, it is suggested that neuroticism is a factor of a specific type of aggression – reactive aggression; this type of aggression arises in provocative situations. Neurotic hostility is said to be present where there is a strong experience of anger; this notion corresponds with reactive aggression (Jovanovića et al., 2011).

H₃ Neuroticism has a significant positive effect on driving anger.

d) Openness to experience

Openness to experience is defined as the need for novel experiences, and tolerance of novel or unknown events (Jovanovića et al., 2011; Traubman-Ben-Ari & Yehiel, 2012). Those who are high on openness to experience tend to be unconventional and curious; these individuals also have the tendency to overlook those of authority, although not necessarily lacking values or in an unethical manner. Angry drivers usually have some sort of egocentric mind-set (Dahlen et al., 2012); in contrast, people who are open to experiences have a weaker egocentric mind-set. These individuals are sensitive, tolerant and broad-minded. Therefore, as identified by Dahlen et al. (2012), drivers who are open will make more realistic and situation-based judgements when they are behind the steering wheel. When attributing driving behaviour to situations, it implies that the errors caused by other drivers are related to circumstances that are mostly out of the control of this driver. They say that this will decrease the manifestation of hostile emotions and expressions (Guo et al., 2016).

In the context of driving behaviours, few studies have found significant relationships between driving anger and openness to experience (Jovanovića et al., 2011). Studies that have proven the relationship between openness to experience and driving anger have proven that those with low

scores on openness to experience had increased tendencies of experiencing driving anger. With that being said, various studies have proven the relationship between openness to experience and traffic accidents (Jovanovića et al., 2011).

H₄ Openness to experience has a significant negative effect on driving anger.

e) Extraversion

Extraversion reflects the need for social stimulation and social relations and the tendency to experience positive emotions. Those who score high on extraversion are mostly talkative, active, cheerful, optimistic and energetic (Jovanovića et al., 2011). Extraversion traits may include excitement seeking, warmth toward others, activity seeking, etc. (Parr et al., 2016; Traubman-Ben-Ari & Yehiel, 2012). Because of the impulsiveness mentioned in the previous section, it is expected that this trait would affect anger and also explain the reason for the increase in the likelihood of this individual displaying driving anger (Dahlen et al., 2012).

Generally, because extraverts are comfortable with interacting with others, one could assume that this individual would aim to impress others and to maintain a reputation, thus increasing the carelessness they exhibit on the roads. These individuals are also more likely to express their opinions and therefore will not be ashamed or shy to express them behind the wheel. Furthermore, studies have shown that extraversion has a significant relationship with peer influences (Parr et al., 2016). Research has suggested that extraversion is positively related to risky driving behaviours, and those who violate traffic regulations are more extraverted than those who do not violate traffic rules (Jovanovića et al., 2011; Roidl, Siebert, Oehl & Hoger, 2013; Traubman-Ben-Ari & Yehiel, 2012).

H₅ Extraversion has a significant positive effect on driving anger.

2.5.2 Emotional intelligence and driving anger

As mentioned before, driving anger is experienced often on the roads. It can be seen as an emotional factor and as a result of various occurrences and frustrating circumstances in which the individual finds himself. Individuals discriminate between their various emotions and then use this information to direct their thinking patterns and behaviours (Arnau-Sabates, Sala-Roca & Jariot-Garcia, 2012). The lack of self-control and self-regulation enhances these emotions and is therefore strongly linked to risky driving behaviours (for example speeding, sensation seeking, aggression,

etc.) (Arнау-Sabates et al., 2012). Research has identified that emotion plays a crucial role in motivating behaviour, and therefore should not be ignored when studying road safety (Arнау-Sabates et al., 2012). Furthermore, emotional intelligence is said to be a combination of logic and emotions. Where bad decisions are made, there is an imbalance between logic and emotions (Van der Nest, 2010); it is assumed that when bad decisions are made on the roads (e.g. aggression, speeding, risk taking, etc.) they are based more on emotions (caused by the situation) than logic.

Arнау-Sabates et al. (2012) conducted a study to determine the relationship between risky driving behaviours and emotional abilities; a strong negative relationship was identified between emotional intelligence and risky attitudes on the road. It was also identified that emotional intelligence increases with age up to the age of fifty. Those with low emotional self-control were associated with having a greater tendency to violate rules and to take risks whilst driving (Arнау-Sabates et al., 2012). It is suggested that emotional intelligence has the potential to either increase or decrease the extent (and intensity) to which a driver becomes angry on the road.

Van der Nest (2010) investigated the relationship between workplace aggression and emotional intelligence among professional drivers. This research shows that a work environment can provoke intense emotions, as it is a source of survival needs (income) and psychological need fulfilment (e.g. esteem, experience, etc.). These intense emotions are driven by various situations, producing action and behavioural outcomes; for example, where there is conflict between colleagues in the workplace, individuals may feel their jobs are threatened, causing heightened emotions (Van der Nest, 2010). The concept of emotional intelligence is grounded in the idea that there is a relationship between reason and emotion, and that emotional and cognitive intelligence are critical to success and also to survival (Van der Nest, 2010).

The dimensions underlying emotional intelligence give the individual the ability to manage emotional reactions to negative situations and manage stress escalating from these situations (Van der Nest, 2010). Behavioural responses extending from workplace situations could influence professional drivers on the roads, thereby increasing driving anger. Individual's inability to regulate and manage their own emotions, perceive others' emotions and behave accordingly may be due to a lack of emotional intelligence.

H₆ Emotional intelligence has a significant negative effect on driving anger.

2.5.3 Moderator variables: gender and age

All human behaviour is influenced to a certain extent by biological factors such as age and gender-related conditions, and therefore has some influence on dangerous driving behaviours. Studies have shown that male drivers tend to show little motivation to comply with traffic regulations compared to female drivers (Vardaki & Yannis, 2013). Jimenez-Mejias et al. (2014) refer to a study conducted in Spain that suggested that the mortality of male drivers is more than four times higher than that of female drivers; this is especially true for male drivers between the ages of 20 and 29 years.

Considering driving anger and differences between genders, communication is an important factor. When communication takes place on the road, it can be said to differ between males and females. Men tend to express anger more on the road than women. This is especially true in traffic congestion (González-Iglesias et al., 2012).

It has also been identified that females are more inclined to implement a quieter form of driving anger than men. Instead of making obscene gestures, as men would do, women rather whisper insults and/or swear words. Males tend to be much more explicit in their forms of anger, and these gestures are directly observable (González-Iglesias et al., 2012; Traubman-Ben-Ari & Yehiel, 2012).

The Driver Anger Expression Inventory has been utilised in various studies to test driving differences between genders. Males receive substantially higher scores on Personal Physical Aggression Expression compared to females, as well as higher scores on Use of Vehicle to Express Anger (González-Iglesias et al., 2012).

Possible reasons for the more timid style of females could be their tendency to foresee potential risky behaviours or situations. They also tend to determine (better than men) whether or not their behaviours would have future consequences. This is seen as the avoidance of driving anger, which could be a response to other parties on the road; it is also identified as a self-protective measure adopted by females (González-Iglesias et al., 2012; Wickens, Mann, Stoduto, Butters, Ialomiteanu & Smart, 2012).

H7 Gender has a moderating effect on the relationship between agreeableness and driving anger.

H₈ Gender has a moderating effect on the relationship between conscientiousness and driving anger.

H₉ Gender has a moderating effect on the relationship between neuroticism and driving anger.

H₁₀ Gender has a moderating effect on the relationship between openness to experience and driving anger.

H₁₁ Gender has a moderating effect on the relationship between extraversion and driving anger.

H₁₂ Gender has a moderating effect on the relationship between emotional intelligence and driving anger.

A number of traffic researchers have found that young drivers are involved in more traffic accidents (Wickens et al., 2012). The factors giving rise to this include aspects such as the lifestyle that they live, their driving inexperience, the risks that they take, their poor perception and, lastly, their tendency to drive after drinking (Özkan et al., 2005; Traubman-Ben-Ari & Yehiel, 2012; Zhang & Chan, 2016). Vardaki et al. (2013) state that younger drivers are more prone to be involved in traffic accidents due to increased traffic violations.

Modern times have shifted the views that people have of transport. Vehicles appear to be seen by a big part of the population as a status symbol instead of a pure form of transportation (Jonah, 1986). For young adolescences, owning a car and even driving without parental supervision can generate feelings of adulthood and freedom. For this reason, instead of seeing the use of a car as getting from point 'A' to point 'B', young adults see it as their mark of independence (Constantinou et al., 2011). Unfortunately, this leads to irresponsible behaviours on the roads, where there is an increase in angry driving behaviours and more risky driving behaviours. Constantinou et al. (2011) indicate that, when amongst peers, these tendencies increase even more. Males are especially prone to these actions, as it could be a manner in which they can show manhood.

In all male species, animal and human, young men operate in order to attract females. While driving, men want to show dominance and fearlessness to impress females. This could be a cause of the increase in fatal accidents amongst young males. They want to make sure people can see that they are masculine and that they can dominate, hence increase their reckless behaviours on the roads (Constantinou et al., 2011).

H₁₃ Age has a moderating effect on the relationship between agreeableness and driving anger.

H₁₄ Age has a moderating effect on the relationship between conscientiousness and driving anger.

H₁₅ Age has a moderating effect on the relationship between neuroticism and driving anger.

H₁₆ Age has a moderating effect on the relationship between openness to experience and driving anger.

H₁₇ Age has a moderating effect on the relationship between extraversion and driving anger.

H₁₈ Age has a moderating effect on the relationship between emotional intelligence and driving anger.

Gender (section 2.4.3) and age (section 2.4.4) have been discussed in the context of the driving environment. It is said that both gender and age have the potential to influence driving anger, whether directly or indirectly; in this study it has been hypothesised that gender and age act as moderator effects on driving anger.

2.5.4 Summary

This section discussed the relationship between and consequent hypotheses on the dependent variable and latent variables, as well as possible moderator effects. The conceptual model below presents the hypotheses determined in this section. As mentioned in Chapter 1, driving behaviours form part of a larger model, with internal and external driving characteristics interacting with each other; this then leads to traffic outcomes and consequences. The next section discusses the consequences of driving behaviours, especially the outcomes of driving anger and its influence on traffic safety and accidents.

2.6 TRAFFIC ACCIDENTS AS A CONSEQUENCE OF DRIVING ANGER

As mentioned, traffic accidents (according to the theoretical model) are a consequence or outcome of internal and external factors interacting within a larger system. Even though accident rates differ between countries and cultures, they remain a consequence of using the roads (Sarbescu et al., 2012). The World Health Organization has reported that Africa has the highest fatality rate on the roads; on average, 28.3 people per 100 000 of the population die as a consequence of traffic accidents. Traffic accidents therefore are a complex, multi-dimensional health issue, resulting from

mostly human factors, as well as environmental and vehicle factors (Gidron, Gaygisiz & Lajunen, 2014; Zhang, Chan & Zhang, 2015).

Human beings are inclined to attend selectively to environmental prompts that allow us to make judgments about the world around us (Horrey, Lesch, Mitsopoulos-Rubens & Lee, 2015). Along with these judgements, there is a degree of introspection; in other words, we evaluate how capable we are in different situations. The perception we have of the world, as well as the perception we have of our abilities, has an impact on the decisions that we make, the behaviours we display, and the risks we take (Horrey et al., 2015). Driving anger is frequently coupled with risky behaviours and emotional states (Dahlen et al., 2012). These factors are said to interfere with judgment, perception, information processing and attention (Dahlen et al., 2012).

As mentioned, this study focuses on the propensity to become angry behind the wheel; hence, the study is centred on driving anger. Research shows that there is a strong positive relationship between driving anger and driving aggression (Ge et al., 2016; Zhang & Chan, 2016). Driving aggression (as revealed) is risky driving behaviour that deliberately endangers the lives of other drivers. With this evidence, one can further assume that driving anger leads to driving aggression/driving anger expression (for example, sounding the horn, speeding, etc.); research suggests that, as one gets angry behind the wheel, aggressive tendencies increase (Ge et al., 2016; Zhang & Chan, 2016).

One of the leading factors threatening traffic safety is said to be aberrant driving behaviours, i.e. speeding, running red lights and other risky driving behaviours (Zhang et al., 2015). Studies show that there is a positive relationship between driving anger and aberrant driving behaviours. Furthermore, Zhang et al. (2015) suggest that driving anger has the potential to affect the cognitive performance of drivers due to the intense nature of the emotions, e.g. impaired judgement and reasoning.

Unfortunately, where there is an overestimation of abilities, problems could occur on the roads. This is especially true for younger males; these individuals generally overestimate their driving skills and tend to rate their own driving capabilities as more skilful than that of other drivers (Begg & Langley, 2004). Research shows that 95% of traffic accidents are caused by human factors (Ulleberg & Rundmo, 2003). Furthermore, a study conducted in the USA found that the cost of

traffic accidents is roughly \$230.6 billion per annum and is the main cause of death among individuals between the ages of one and 44 years (Dahlen et al., 2012).

Begg and Langley (2004) state that young drivers between the ages of 18 and 25 years have a greater possibility of being involved in car accidents compared to older drivers. Therefore, they suggest that car accident involvement starts to decrease from the age of 24 years. It is assumed that, by this age, most young drivers would have gained substantial driving experience, which is expected to increase safer driving behaviours (Begg & Langley, 2004). Individuals who are inexperienced, and have poor concentration and attention on the roads, are prone to form part of the overrepresentation of young drivers involved in car accidents (Begg & Langley, 2001).

Driving anger has been identified as a key contributor to traffic accidents (Fernandes, Hatfield & Job, 2010; Zhang et al., 2015). Increased speeding was found to be consistent with driving anger (Fernandes et al., 2010). The study by Fernandes et al. (2010) suggests that at least a third of all traffic accidents can be attributed to angry driving behaviours; this is in agreement with the literature that states that driving anger tendencies increase the risk of traffic accidents (Dahlen et al., 2012). Hence, it is important to understand driving anger and, ultimately, to prevent these tendencies.

Attitudes towards safety on the roads have been correlated with driving anger, speeding and accident involvement. Specifically, young drivers underestimate driving risks (Ulleberg & Rundmo, 2003). Individuals who are prone to aggressive emotions on the roads are suggested to be easily frustrated and angered. These emotions may manifest in speeding, tailgating and risky driving behaviours. Therefore, research suggests that becoming angry in traffic may trigger a response like rule violations and speeding (Ulleberg & Rundmo, 2003).

Accidents are a significant concern for modern society. Because of the high costs, they have the potential to add to economic pressures (Delhomme, Chaurand & Paran, 2012); medical and health costs, as well as public material damage, are increasing and becoming a major concern for the South African government. Not only do injuries caused by traffic accidents impair the workforce (for example, dismissal of injured employees due to lack of performance, and costs of training replacement staff), they also affect productivity. These injuries add to the burden of medical costs (for example emergency vehicles and personnel, hospital expenses, rehabilitation costs, etc.), as

well as the loss of resources and quality of life (for example loss of income, pain and suffering). Interventions are needed to minimise this occurrence on South African roads.

Figure 2.2 below illustrates the interaction between individual characteristics and driver characteristics as mentioned in the model; driving anger therefore becomes the dependent variable, influenced by these person factors. The conceptual model therefore illustrates the possible effects that these variables could have on driving anger. The goal now is to determine how extensive the effect is between these independent variables and the dependent variable.

2.7 CONCEPTUAL MODEL

Based on the literature review, driving anger is not a random event, but a phenomenon occurring within a complex nomological network comprising many antecedents. The conceptual model (Figure 2.2.) presents the latent variables, and the relationships between these variables and driving anger, as well as the hypotheses formulated.

2.8 CHAPTER SUMMARY

Chapter 2 began with a brief overview of traffic psychology and driving anger. Driving anger was then discussed in the context of professional drivers, an aspect that extends through the study and also is included in the measurement of driving anger. The theoretical foundations of the latent variables were discussed and motivated in terms of traffic psychology. An explanation of the relationships between driving anger and the latent variables followed, and the hypotheses to be tested were presented. The research-initiating question that arose from the literature review asks: “Which prominent individual characteristics influence driving anger?” The next chapter will present the methodology used to conduct the research and to test the presented hypotheses.

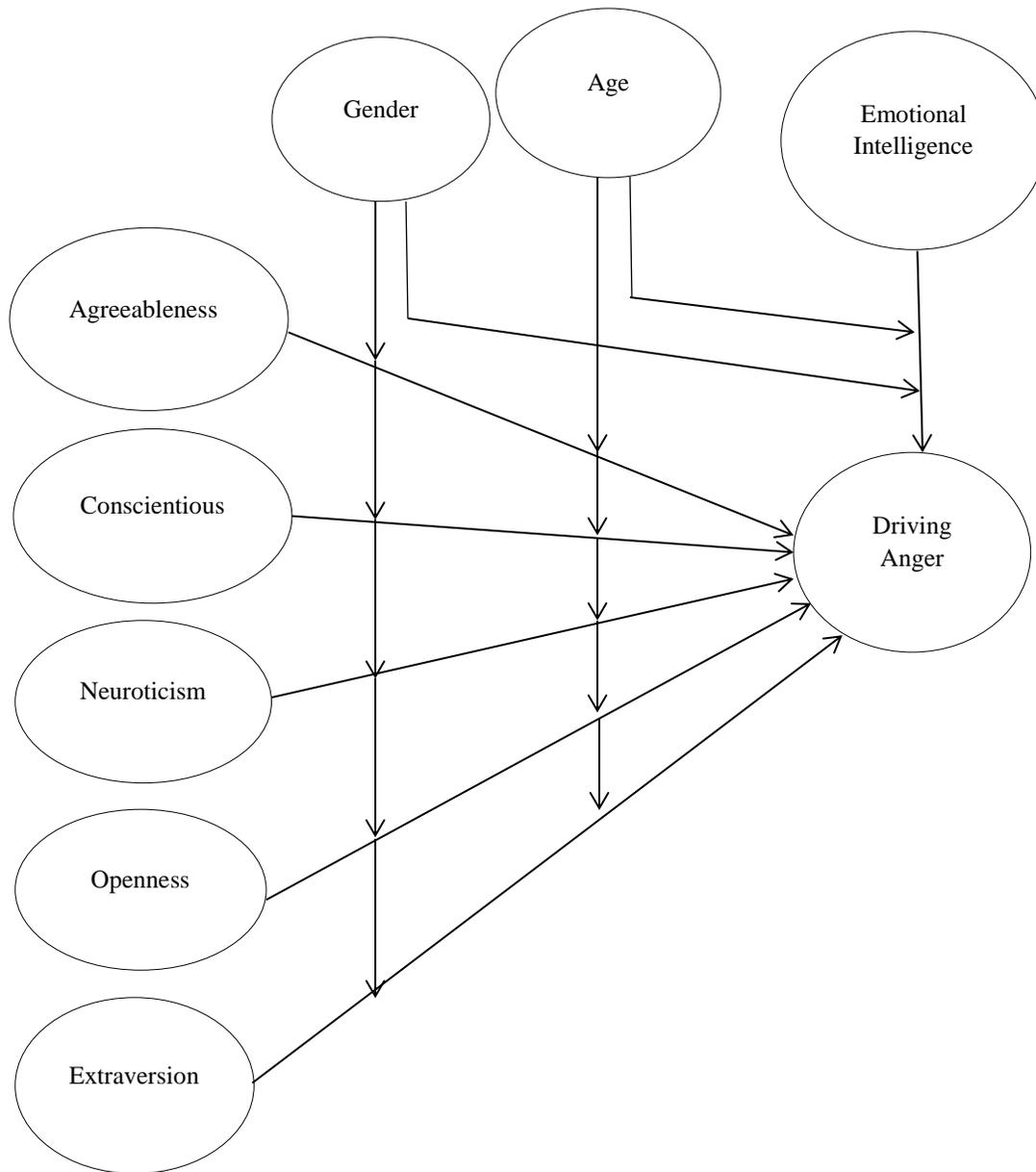


Figure 2.2. Conceptual model

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

Following the literature review, this chapter presents the methodology applied throughout the research process in order to answer the research-initiating question:

“Which prominent individual characteristics influence variation in driving anger?”

The research methodology purposefully serves the epistemic ideal of searching for truthful knowledge (Babbie & Mouton, 2001). Theron (2014) states that the validity and reliability of the explanations stemming from the proposed model are dependent on the method of inquiry used to arrive at the specific explanations. Therefore, the probability of exposing valid and credible verdicts is a function of the methodology used. The scientific method as the method of inquiry that serves the epistemic ideal through the control mechanisms of rationality and objectivity (Babbie & Mouton, 2001).

The purpose of this study was not to examine a random event, as the determinants of this phenomenon need to be investigated. The testing of the stated hypotheses is important for future research, developing interventions and expanding traffic psychology, as limited research has been conducted on this subject. For industrial psychologists it is of the utmost importance to study human behaviour in order to add to the fruitfulness of explanations regarding these behaviours, especially in an occupational context. In this case, understanding what could cause various acts that are considered as part of traffic psychology could potentially create a safer environment on our roads, especially in the light of the shocking statistics.

Before attending to the methodology utilised in this research study, the study objectives should be revisited. As mentioned earlier, the primary objective of this study was to determine possible individual characteristics influencing driving anger. Further aims of the research study were to:

- Investigate the phenomenon of driving anger;

- Based on the literature review, identify and test prominent antecedents of driver behaviours on the roads, i.e. the extent to which specific individual characteristics influence driving behaviours;
- Highlight findings and conclusions and suggest their implications for professional drivers in industry; and
- Identify other major determinants of driving anger as recommendations for future research in the area of traffic psychology, which has not yet been considered previously.

This chapter clearly identifies the tools and procedures used in the study. The chosen research design will be discussed, followed by the sampling of relevant participants. Next, the measurement instruments used in the study will be described and discussed; it will be of the utmost importance to consider the validity and reliability of each of the measurement instruments. Finally, together with data collection and capturing, the implemented statistical analysis will be explained.

3.2 SUBSTANTIVE RESEARCH HYPOTHESES

The structural model presented in the Figure 2.2 presents the hypotheses developed from the literature review in Chapter 2. The hypotheses stated were formulated in terms of latent variables, which form the substantive research hypotheses. It is important to note that substantive research hypotheses cannot be tested; these hypotheses must first be transformed into operational terms.

Nonetheless, substantive research hypotheses, developed through theorising, are essential for the empirical testing of the proposed structural model (Abrahams, 2014; De Villiers, 2015). The substantive research hypotheses are presented below as path-specific research hypotheses. Following these hypotheses is a structural representation of the variables under investigation.

Hypothesis 1: A negative relationship exists between agreeableness (ξ_1) and driving anger (η_1)

Hypothesis 2: A negative relationship exists between conscientiousness (ξ_2) and driving anger (η_1)

Hypothesis 3: A positive relationship exists between neuroticism (ξ_3) and driving anger (η_1)

- Hypothesis 4:** A negative relationship exists between openness to experience (ξ_4) and driving anger (η_1)
- Hypothesis 5:** A positive relationship exists between extraversion (ξ_5) and driving anger (η_1)
- Hypothesis 6:** A negative relationship exists between emotional intelligence (ξ_6) and driving anger (η_1)
- Hypothesis 7:** Gender has a moderating effect (ξ_7) on the relationship between agreeableness and driving anger (η_1)
- Hypothesis 8:** Gender has a moderating effect (ξ_8) on the relationship between conscientiousness and driving anger (η_1)
- Hypothesis 9:** Gender has a moderating effect (ξ_9) on the relationship between neuroticism and driving anger (η_1)
- Hypothesis 10:** Gender has a moderating effect (ξ_{10}) on the relationship between openness to experience and driving anger (η_1)
- Hypothesis 11:** Gender has a moderating effect (ξ_{11}) on the relationship between extraversion and driving anger (η_1)
- Hypothesis 12:** Gender has a moderating effect (ξ_{12}) on the relationship between emotional intelligence and driving anger (η_1)
- Hypothesis 13:** Age has a moderating effect (ξ_{13}) on the relationship between agreeableness and driving anger (η_1)
- Hypothesis 14:** Age has a moderating effect (ξ_{14}) on the relationship between conscientiousness and driving anger (η_1)
- Hypothesis 15:** Age has a moderating effect (ξ_{15}) on the relationship between neuroticism and driving anger (η_1)
- Hypothesis 16:** Age has a moderating effect (ξ_{16}) on the relationship between openness to experience and driving anger (η_1)

Hypothesis 17: Age has a moderating effect (ξ_{17}) on the relationship between extraversion and driving anger (η_1)

Hypothesis 18: Age has a moderating effect (ξ_{18}) on the relationship between emotional intelligence and driving anger (η_1)

3.3 THE STRUCTURAL MODEL

The literature review presented above can be concluded in the form of a structural model. This structural model is a representation of the hypotheses developed as a response to the research-initiating question. Once the latent variables have been operationalised, the model allows for the formulation and empirical testing of hypotheses. The suggested structural model is illustrated in Figure 3.1.

Comparing the structural model (Figure 3.1) with the conceptual model (Figure 2.2), it becomes clear that there are various differences. The additional variables presented in Figure 3.1 represent *dummy* variables. *Dummy* variables were created as separate variables necessary to test the moderating effects in SEM. Moderating effects are tested by multiplying the score of the specific moderating variable with the score of the independent variable that is hypothesised to influence the dependent variable (Langenhoven, 2015).

Table 3.1 provides a summary of the latent variables depicted in the structural model (Figure 3.1). The moderating variables (indicated by “*”) subsequently becomes the dummy variables that influence the endogenous latent variable (driving anger).

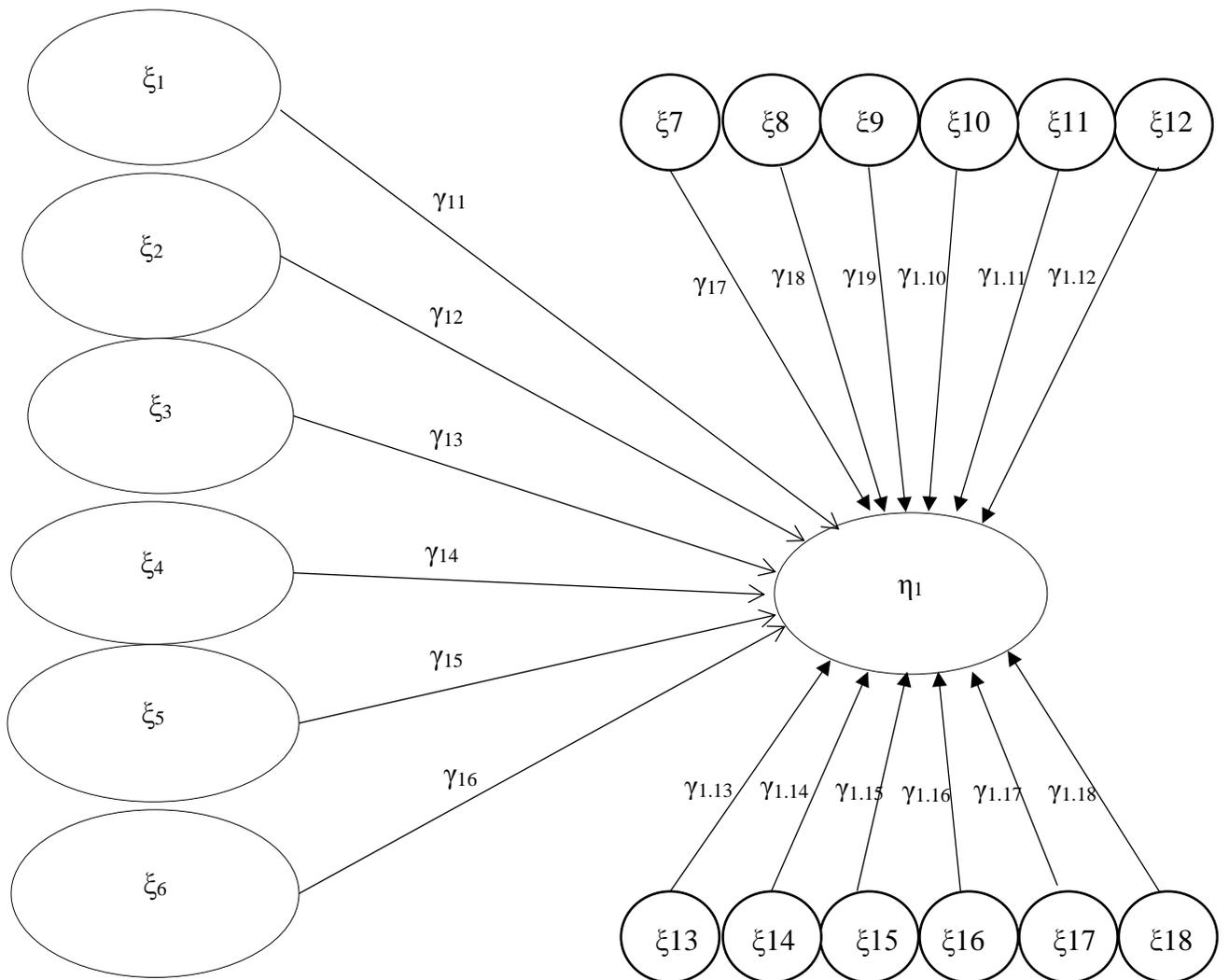


Figure 3.1. Structural model

Table 3.1***Summary of latent variables***

$\eta 1$	Driving anger
$\xi 1$	Agreeableness
$\xi 2$	Conscientiousness
$\xi 3$	Neuroticism
$\xi 4$	Openness to experience
$\xi 5$	Extraversion
$\xi 6$	Emotional Intelligence
$\xi 7$	Gender*agreeableness <i>influences</i> driving anger
$\xi 8$	Gender*conscientiousness <i>influences</i> driving anger
$\xi 9$	Gender*neuroticism <i>influences</i> driving anger
$\xi 10$	Gender*openness to experience <i>influences</i> driving anger
$\xi 11$	Gender*extraversion <i>influences</i> driving anger
$\xi 12$	Gender*emotional intelligence <i>influences</i> driving anger
$\xi 13$	Age*agreeableness <i>influences</i> driving anger
$\xi 14$	Age*conscientiousness <i>influences</i> driving anger
$\xi 15$	Age*neuroticism <i>influences</i> driving anger
$\xi 16$	Age*openness to experience <i>influences</i> driving anger
$\xi 17$	Age*extraversion <i>influences</i> driving anger
$\xi 18$	Age*emotional intelligence <i>influences</i> driving anger

3.4 STATISTICAL HYPOTHESES

The formulation of statistical hypotheses for any study should be based on two aspects, one being the nature of the substantive hypotheses that have been determined, and the other being the research design. These factors act as parameters for the development on the hypotheses (Theron, 2013). The model that has been depicted indicates some of the antecedents of driving anger. The

variables that possibly affect driving anger act as the independent variables, whereas driving anger represents the dependent variable.

In this case there were eight affecting variables, which are known as *ksis*' or exogenous latent variables, and driving anger acts as an endogenous latent variable or *eta*. The structural model proposes paths between these independent variables and the dependent variable. The statistical hypotheses below represent the logic underlying the structural model, the research design and the nature of the statistical analysis techniques associated with an *ex post facto* correlational design (Theron, 2014); this being said, the statistical analysis technique that was appropriate for the analysis of data from the *ex post facto* correlational design was structural equation modelling (SEM) (Nell, 2012).

The number of statistical hypotheses developed should represent the number of paths in the structural model (in this case there were eighteen paths). Another fact to note is that the sign of the alternative hypotheses will depend on the 'argument' that is represented by the path (i.e. positive or negative) (Theron, 2013). The following statistical hypotheses were formulated using the structural model depicted in Figure 3.1.

Hypothesis 1:

- $H_{01}: \gamma_{11} = 0$
 $H_{a1}: \gamma_{11} > 0$

Hypothesis 2:

- $H_{02}: \gamma_{12} = 0$
 $H_{a2}: \gamma_{12} > 0$

Hypothesis 3:

- $H_{03}: \gamma_{13} = 0$
 $H_{a3}: \gamma_{13} < 0$

Hypothesis 4:

- $H_{04}: \gamma_{14} = 0$
 $H_{a4}: \gamma_{14} < 0$

Hypothesis 5:

- $H_{05}: \gamma_{15} = 0$
 $H_{a5}: \gamma_{15} > 0$

Hypothesis 6:

- $H_{06}: \gamma_{16} = 0$
 $H_{a6}: \gamma_{16} < 0$

Hypothesis 7:

- $H_{07}: \gamma_{17} = 0$
 $H_{a7}: \gamma_{17} > 0$

Hypothesis 8:

- $H_{08}: \gamma_{18} = 0$
 $H_{a8}: \gamma_{18} > 0$

Hypothesis 9:

- $H_{09}: \gamma_{19} = 0$
 $H_{a9}: \gamma_{19} > 0$

Hypothesis 10:

- $H_{010}: \gamma_{1.10} = 0$
 $H_{a10}: \gamma_{1.10} > 0$

Hypothesis 11:

- $H_{011}: \gamma_{1.11} = 0$
 $H_{a11}: \gamma_{1.11} > 0$

Hypothesis 12:

- $H_{012}: \gamma_{1.12} = 0$
 $H_{a12}: \gamma_{1.12} > 0$

Hypothesis 13:

- $H_{013}: \gamma_{1.13} = 0$
 $H_{a13}: \gamma_{1.13} > 0$

Hypothesis 14:

- $H_{014}: \gamma_{1.14} = 0$
 $H_{a14}: \gamma_{1.14} > 0$

Hypothesis 15:

- $H_{015}: \gamma_{1.15} = 0$
 $H_{a15}: \gamma_{1.15} > 0$

Hypothesis 16:

- $H_{016}: \gamma_{1.16} = 0$
 $H_{a16}: \gamma_{1.16} > 0$

Hypothesis 17:

- $H_{017}: \gamma_{1.17} = 0$
 $H_{a17}: \gamma_{1.17} > 0$

Hypothesis 18:

- $H_{018}: \gamma_{1.18} = 0$
 $H_{a18}: \gamma_{1.18} > 0$

3.5 RESEARCH DESIGN

The research design can be defined as the structure of enquiry that is created in order to obtain answers to research questions. Therefore, the research design serves as a plan for how the research and data collection will be executed. The type of research executed is not chosen randomly, but instead is based on the research-initiating questions, the research objectives, as well as the evidence needed to test the stated hypotheses.

A cross-sectional study was used to collect data from the selected sample of professional and non-professional drivers in order to make inferences, to confirm previous research, and to develop possible interventions.

The research design followed to measure driving anger and its antecedents was the *ex post facto* correlational design. *Ex post facto* correlational design is defined as a systematic empirical inquiry in which the researcher does not have direct control over the determined independent variables. This is because, as stated before, the manifestation of these variables has already taken place; they cannot be manipulated. Here, correlations were determined and inferences made about the relations between the variables, based on these correlations. It can also be said that this kind of research is based on the scientific and analytical testing of both the dependent and independent variables.

The design therefore identifies whether or not there is causation between the variables. An *ex post facto* design is seen as a non-experimental design; however, it includes quantitative variables. This also means that no random assignment occurs, and therefore variables are observed as they occur naturally (Johnson, 2001). Whether individuals get angry on the road can only be observed, and in this manner a relationship can be determined between the affecting variables and this driving behaviour. This causal relationship could be determined by observing drivers behind the wheel; however, this is seen as a negative aspect of the design, as inferences made in this manner could be incorrect. The *ex post facto* correlational design is also criticised for its limitations in its inability to randomly assign measures to groups, as well as for the exclusion of manipulation.

By using an *ex post facto* correlational design, the researcher is able to maximise systematic error variance, minimise error variance, and control for extraneous variance (Theron, 2014). Hence, this type of research design has the ability to increase the likelihood of providing unambiguous empirical evidence to test the hypotheses (Langenhoven, 2015; Nell, 2015).

Using this research design, the researcher calculated the observed covariance matrix by obtaining the measure on the observed variables. The objective was to reproduce the observed covariance matrix as closely as possible; this was achieved by obtaining the estimates for the freed structural parameters (Theron, 2013). Therefore, if the fitted model fails at reproducing the covariance matrix, it means that the structural model does not provide an accurate explanation of the observed

covariance matrix. In this case, and within this study, it would indicate that the relationships hypothesised within this structural model of traffic psychology do not lead to the exact representation of driving anger.

3.6 RESEARCH PROCEDURE AND SAMPLING SIZE

Sampling comprises the selection of a segment of the total population, in this case road users or drivers (Babbie & Mouton, 2001). For the purposes of this study, participants were mostly Pepkor employees. This included employees of PepSA and Pepkor Logistics. Pepkor Logistics was especially useful for collecting data of professional drivers. Lube Marketing (Pty) Ltd (a distribution agent of Castrol Oil) was also included in the study; Lube Marketing (Pty) Ltd employees spend most of their working hours on the road. Finally, networking and social media (Facebook) allowed the researcher to reach other, non-professional drivers.

Institutional permission was requested by the directors of Lube Marketing, the HR manager of Pepkor Logistics and the psychologist at PEP in order to send out mass emails to employees. All employees were contacted using mass electronic mail. An informed consent form was submitted and ethical clearance was granted by Stellenbosch University.

A questionnaire was distributed in Lube Marketing by an employee (agreed upon by the directors); this employee was not in a managerial position, as coercion to take part in the study was avoided at all times. An email template was provided to this employee in order to emphasise informed consent. Employees could withdraw or refuse participation without any negative consequences.

Using networking strategies, pensioners were asked to take part in the study; this was for age group purposes. Social media such as Facebook were used to reach individuals who were unemployed. Friends were asked personally on Facebook to take part in the study. They were also requested to send the link to their friends on Facebook. The aim of using social media was to create richness in the target population to ensure that it was not only Pepkor employees and Lube Marketing employees who participated in the study.

Further networking took place through emails that were sent to the friends and family of the researcher. These individuals were requested to forward the email containing the hyperlink to the questionnaire to their acquaintances, and so on.

The individuals who took part in the study of driving anger were individuals over the legal driving age who had the necessary licence to be allowed to drive (this included individuals who had driver's licences but mostly made use of public transport). No under-aged individuals were included, nor do those individuals who did not possess a legal driving licence. Therefore, for the variable of age, all ages were included, as the aim was to obtain a wide range of ages. Because of the relationship between gender and driving anger, all genders were part of the target population, as both males and females had to be included to in the study.

Sampling can occur using two methods, namely probability and non-probability sampling. Probability sampling includes techniques such as random, stratified and cluster sampling, and non-probability sampling includes techniques such as purposive and convenience sampling. The sampling technique that was utilised to gather data for this study is *non-probability convenience sampling*. This is because the participants were selected based on their proximity and availability to the researcher.

To test driving anger and personality attributes, the target population could be any individual, as personality was tested and compared to the hypotheses that were developed for the various aspects of personality. More than one measurement therefore was used on these individuals to compare the findings to that of driving anger. Once again, only individuals who were legally allowed to drive were tested to avoid decreasing the validity of the findings.

When planning a sampling procedure, one needs to take cognisance of the representation and statistical power these groups are required have. Representation of the group will depend on the method of sampling (whether the method used is an accurate portrayal of the target population), and the size of the gap between the target population and the sample group; the bigger the gap, the smaller the chance of representation.

Stratified random sampling is the process of dividing the target population into subgroups (strata) based on certain variables (Theron, 2013). In this case, *stratified random sampling* was utilised when creating the subgroups for the gender and age variables. This means that the sizes of the strata should be close to equal, as this would make comparisons easier. Subgroups were useful for age as an antecedent, as various ages will were to differentiate between younger and older drivers. Strata were developed for various age groups and are discussed in detail in Chapter 4.

As mentioned, the participants were not pressured to complete the questionnaires, but were reminded and encourage to take part in the study over the research period. In the end, a final sample of 199 participants completed the survey. However, 384 participants did not complete the survey, which resulted in a response rate of 34%. Table 3.2 provides a summary of the biographical information of the sample population.

3.7 MEASURING INSTRUMENTS

In order to measure personality attributes, emotional intelligence and the moderating variables, gender and age, various measurement instruments need to be considered. These measurements provide empirical evidence against which the hypotheses can be tested. It is important for the measurement instruments to possess the necessary psychometric properties in order to develop valid and reliable conclusions using the obtained results. A composite questionnaire was developed consisting of various questions from existing questionnaires (discussed in this chapter). The self-administered questionnaire consisted of four sections, namely biographical information of the participants, personality-focused questions (IPIP), and questions on emotional intelligence (SEIS) and driving anger (DAS). Three validated questionnaires were used to measure the latent variables of the study. These measurement models are now discussed, focusing on the nature, composition and psychometric properties of each questionnaire in the self-administered survey.

3.7.1 Big Five personality factors

The Five Factor Model (FFM) consists of five personality factors that act as trait-descriptive adjectives. There have been plenty of studies that have utilised these five personality factors, including studies in traffic psychology. It has been predicted that these personality factors could be antecedents for driving anger. To measure the Big Five personality factors, an instrument called the ‘International Personality Item Pool’ (IPIP) was applied.

a) Description and scoring of the IPIP

The scoring of this questionnaire takes place once respondents have rated the 50 items. Each item has a number 1, 2, 3, 4 or 5 next to it, indicating to which of the five factors it relates. Next to these numbers is either a positive or negative sign (+/-); this indicates the direction of the scoring. For example, 1- would relate to extraversion; however, it would refer to a negative relationship to extraversion; this type of question would be: “I keep to the background” (Özkan, Lajunen & Summala, 2006; *Possible Questionnaire Format for Administering the 50-Item Set of IPIP Big-*

Five Factor Markers [Online]). To receive a total score, all items that contain numbers with positive signs receive a score ranging from 1 to 5, going from “very inaccurate” to “very accurate” respectively (e.g. 1+ rated as “very inaccurate” would receive a score of ‘1’). Items that have numbers with negative signs receive the opposite scoring than that of positive numbers (e.g. 1- rated as “very inaccurate” would receive a score of ‘5’). After the individual items have received their scores, a total score is determined by adding these up (Özkan et al., 2006; *Possible Questionnaire Format for Administering the 50-Item Set of IPIP Big-Five Factor Markers [Online]*).

Each of the five personality factors, required for this study of driving anger was addressed and measured. For anger to have a significant relationship with these factors, it first was necessary to determine each of the five factors within the driver, and then comparisons could be made. This tool has also been used in many traffic psychology studies, which strengthens its usefulness in this case. Relating to the psychometric evidence of the various items, it could also be assumed that the IPIP inventory is a sound measure to utilise.

b) Previous research findings on the psychometric properties of the IPIP

As mentioned, personality traits were measured with the 50-item IPIP. Each of the five factors was assessed by 10 items. These items were rated on a 5-point scale (1 = “very inaccurate”; 5 = “very accurate”) to identify how accurately the item describes the participant. Extraversion has an alpha of 0.87, making it highly reliable; it determines how sociable an individual is, as well as his or her active traits (statements are: “I am the life of the party, “I remain isolated and at the back of any social event”) (Dahlen et al., 2006).

Agreeableness has a reliability coefficient (alpha) of 0.82, indicating high consistency (reliability); it refers to the assessment of the degree to which an individual shows warmth towards others, as well as interest in others (statements include “I feel little concern for others, “I show warmth towards others”). Conscientiousness consists of items that assess one’s dependability and loyalty towards others. It has been determined that conscientiousness has an alpha coefficient of 0.79, which is still above the acceptable level of 0.7; this means that it is reliable, even though it is less than what the other factors produce (statements include: “I like order”, “I am always prepared”) (Dahlen, et al., 2006).

Emotional stability assesses how sensitive an individual is to stress and enquires after his/her variations in emotional experiences. An alpha was calculated at 0.84, which is sufficiently higher than the preferred level; statements include: “I get upset easily”, “I get stressed out quickly” (Dahlen et al., 2006). These relate directly to emotions and how these emotions are controlled. In all aggravating situations, emotion is one of the more direct factors in driving anger. The drivers’ actions and reactions extend from their emotional state at that time, as well as how well it is controlled. The opposite of emotional stability was also used, which is neuroticism.

Lastly, openness to experience contains items that evaluate traits of creativity and the ability to be open to new experience. Sophistication is also included in this personality factor. The reliability coefficient has been calculated as $\alpha = 0.84$ (Dahlen et al., 2006). The measure of openness to experience is said to be consistent and therefore is useful; statements include: “I have a vivid imagination”, “I am open to novel situations”.

This version of the IPIP has been correlated with the equivalent scales of the NEO inventory. The NEO inventory is a type of IPIP inventory; it consists of 60 items (12 items within each of the five factors) (Gow, Whiteman, Pattie & Deary, 2005). Internal consistencies have also been proven within the IPIP. Agreeableness and openness correlated less strongly. These correlations have been determined as $r = 0.49$ for agreeableness and $r = 0.59$ for openness (Gow et al., 2005).

3.7.2 Emotional intelligence

Emotional intelligence has been defined as the capacity to reason about emotions, and to use emotions to enhance thinking. It is said to comprise of the ability to perceive emotions, to produce emotions necessary to assist thought processes, to understand and perceive the emotions of others, and to regulate one’s own emotion according to various situations (Jonker & Vosloo, 2008). The underlying belief is that emotional intelligence includes IQ, and therefore the measurement of emotional intelligence is questionable. Furthermore, researchers suggest that the development of emotional intelligence measures has not progressed nearly as much as the interest in the construct itself (Jonker & Vosloo, 2008).

Emotional intelligence is receiving increasing interest in many domains of psychology. It is generally studied to identify problem solving, as well as adaptive methods of coping in various situations (Kun, Urban, Paksi & Csobor, 2011). As mentioned, emotional intelligence remains a

novel concept; this could be attributed to the questions that arise concerning the definition, components and content of this construct (Kun et al., 2011). A number of measures have been developed, but lack evidence regarding psychometric properties. Research regarding these properties is still in the early stages of progression, resulting in unresolved research problems (Jonker & Vosloo, 2008). Schutte et al. (1998) emphasise the importance of valid and reliable measures, especially because advancement in this construct is needed (Jonker & Vosloo, 2008).

It is important to note the difference between trait emotional intelligence and ability emotional intelligence. Trait emotional intelligence is measured using tests of typical performance (self-reported questionnaires), and ability emotional performance is assessed with maximal performance tests (Jonker & Vosloo, 2008). Self-report questionnaires are a widespread manner in which emotional intelligence can be measured (Kun et al., 2011). These questionnaires provide an estimate of the individual's level of emotional intelligence, as the test-taker rates him/herself according to a number of dimensions of emotional intelligence. The advantage of applying a self-report questionnaire is that it is fast and easy to administer (Kun et al., 2011). A disadvantage is that it is less connected to emotions when compared to performance tests. In this study, a self-report questionnaire was administered, simply because of logistical considerations and because it is easy and quick to administer (Kun et al., 2011).

a) Description and scoring of the SEIS

The SEIS consists of 33 self-reported items and requests that test-takers rate the extent to which they agree or disagree with the statement. A five-point Likert scale is used, where 1 = strongly disagree and 5 = strongly agree. Example statements include "I know when to speak about my personal problems to others", "I am aware of my emotions as I experience them" and "I am aware of the non-verbal messages other people send". A total score is then derived by adding the responses to each statement (Jonker & Vosloo, 2008). This measurement instrument assesses expression, perception, regulation and understanding of emotions of self and the perception of others' emotions. Research states that the SEIS is a reasonable option as a shortened emotional intelligence scale. Furthermore, research indicates that the SEIS shows criterion and discriminant validity (Jonker & Vosloo, 2008).

The problem with the measurement of emotional intelligence is that it has to address inherent subjective emotional experiences. Compared to cognitive ability assessments, emotional

intelligence cannot be scored objectively; in many of the cases there are no specific criteria for correct and incorrect responses. Moreover, many of the measures developed for emotional intelligence lack satisfactory psychometric properties, which was a limitation in this study.

b) Previous research on the psychometric properties of the SEIS

The Schutte Emotional Intelligence Scale (SEIS) is a self-report emotional intelligence measure that consists of 33 items. The SEIS assesses an individual's perception regarding his/her ability to regulate own emotions and identify others' emotions, and to use this information for thinking processes and problem solving (Davies, Lane, Devonport, & Scott, 2010). There is increasing interest in this measure, mostly because of its brevity when compared to other measures (Jonker & Vosloo, 2008). Research has reported satisfactory internal consistency reliability ($r = 0.87$ to 0.90), as well as adequate test-retest reliability ($r = 0.78$) (Davies et al., 2010). In addition, the Cronbach alpha was found to be between 0.70 and 0.85 (Jonker & Vosloo, 2008). There also is evidence that the SEIS correlates moderately to highly with the Big Five personality factors (Davies et al., 2010). Conversely, the SEIS has been criticised for its shortage of reverse-keyed test items (Jonker & Vosloo, 2008).

3.7.3 Gender and age

In order to measure the moderating effect that gender and age have on driving anger, biographical information was gathered when the questionnaires were sent out. Participants were asked to state their age and gender. This data was used in the analysis in order to determine the moderating effects of age and gender. As mentioned, it was predicted that, as individuals get older, the extent to which driving anger is experienced decreases. Furthermore, it was predicted that young adults between the ages of 18 and 25 get angry more often than those who over 40.

Regarding gender, it was predicted that men are more violent in their driving anger. They also tend to become angry more frequently. Females were predicted either to show angry behaviours indirectly (non-violently) and/or do so less frequently than males. Data regarding gender and the responses to the questionnaire were compared (male participants were compared with female participants) and are discussed in the next chapter. The table below presents the biographical information of participants.

Table 3.2***Biographical Information of the Sample (N = 199)***

<i>Gender</i>		
<i>Variables</i>	<i>Frequency</i>	<i>Percentage</i>
Male	79	40%
Female	120	60%

<i>Age</i>		
<i>Minimum; Maximum; Most Frequent</i>	<i>Mean</i>	<i>Standard Deviation</i>
20; 76; 26	37	12.5

<i>Ethnic group</i>		
<i>Variables</i>	<i>Frequency</i>	<i>Percentage</i>
African	5	3%
Indian	4	2%
Coloured	27	14%
White	163	81%

<i>Language</i>		
<i>Variables</i>	<i>Frequency</i>	<i>Percentage</i>
Afrikaans	119	59%

English	74	37%
isiXhosa	3	2%
isiZulu	1	1%
Sesotho	0	0%
Other	2	1%

Education

<i>Variables</i>	<i>Frequency</i>	<i>Percentage</i>
Primary school	1	1%
High school	11	6%
Matric	37	18%
Certificate	11	6%
Diploma	45	22%
Degree	39	19%
Postgraduate degree	52	26%
Other	3	2%

Years of driving experience

<i>Minimum; Maximum; Most frequent</i>	<i>Mean</i>	<i>Standard Deviation</i>
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(Deffenbacher et al., 1994). This indicated that the scale would be a good measure to use when investigating the rate at which an individual becomes angry on the road.

The participants in this study received the shortened version of the DAS. Each of the 14 items describes scenarios that could possibly evoke angry behaviour. The response options were on a five-point Likert-type scale (1 = “not at all”; 5 = “very much”); the respondents used the continuum to rate their possible reactions to the identified scenario, and how they thought they would behave in the specific situations. This scale provided valuable information about driving behaviour, as well as gender and age. It could also be compared to personality aspects that result from instruments used to measure the drivers’ personality attributes.

The rationale behind using the DAS was based on the fact that it correlates positively with measures of the intensity as well as frequency of anger, aggression and risky behaviours on the road (Deffenbacher et al., 2003; Li et al., 2014; Sullman & Stephens, 2013). The main purpose of this study was an attempt to determine why individuals become angry on the road. Therefore, it was vital to determine how individuals manage driving anger so that comparisons could be made with regard to the independent variables.

One criticism of the DAS, however, is that it gives an overall score. This hinders the possibility to differentiate between the various forms of driving anger (Dahlen et al., 2005). In other words, an individual would simply achieve one overall score. Individuals’ scores can be compared to each other; the higher the score, the higher the driver’s propensity to become angry.

3.8 MISSING VALUES

Missing values occur when participants do not respond to the measurements given to them, as well as from the low number of participants in the study. Missing values had to be addressed before the data could be analysed statistically, as the presence of missing data would result in the inability to analyse the respondents’ answers. This would affect the inferences made about the relationships between variables. The likelihood of missing values occurring is great when survey data is used; this is because of non-responses by participants. Missing values would cause a negative impact on the indicator variable. Methods to rectify missing values range from data imputation (multiple imputation, imputations by matching, as well as full information maximum likelihood imputation) to data deletion (listwise deletion or pairwise deletion) (Jöreskog & Sörbom, 1996). The survey in

this study was distributed via electronic mail and social media using a hyperlink. This decreases the types of missing values to non-responses and incomplete responses, which effectively decrease the methods to rectify missing values to *listwise* deletion.

Listwise deletion is where the cases that contain the missing data are simply omitted from the sample group in order to run the analysis of the remaining cases. This decreases the sample size and does not have true advantages. Unfortunately, it has been determined that this form of treatment for missing values leads to unbiased parameter estimates (Howell, 2012). As mentioned, this study made use of an online survey, which did not include incomplete or non-responses in the completed responses. Therefore, *listwise deletion* was used.

A total of 384 participants did not complete the survey. The online survey would not let respondents continue to the next section if the current one was not complete. If respondents simply exited the programme, it would have been registered as incomplete. These incomplete responses were omitted from the study, which refers to *listwise deletion* (deletion or exclusion of the entire record). This decreased the sample size tremendously, which potentially affected the strength of the findings.

3.9 STATISTICAL ANALYSIS

The purpose of statistical analysis is to use various methods to analyse the data that is received during the data collection period. It is also needed for the researcher to test the structural model developed for driving anger. The statistical analysis was done by using item analysis, factor analysis and structural equation modelling.

3.9.1 Data analysis

The data analysis techniques utilised in this study were directed by the research questions to be answered. A quantitative approach was followed in this study. This refers to data that is collected, measured and calculated in order to identify the properties that these variables hold in relation to driving anger. It is important that the data collected be in numerical form, and that the measurement provides numerical results. Measurement and comparisons were the best method to test the hypotheses determined for this aspect of traffic psychology in order to be able to make inferences about whether or not to reject the hypotheses.

Most studies in traffic psychology base their methodologies on quantitative research, as leaving data in its original form would be of less value (qualitative approach). When data is analysed and quantified, it is possible for researchers to develop 'lawful' conclusions with regard to the relationship between the variables based on these numerical findings. These conclusions could then be tested for their reliability and validity and, based on this, could be implemented or disregarded. In other words, quantitative research makes it possible for these hypotheses to be tested numerically to determine the relationship between the variables and driving anger.

The other main characteristic to consider is objectivity when quantifying results. As some of the variables chosen in this study could be seen as stereotyping (for example gender), it was of the utmost importance that the researcher's opinion did not interfere with the measurement and actual analysis of the collected data; this leads back to the aspect of the reliability of the research (Hoe & Hoare, 2012).

Therefore, during the study of driving anger, a quantitative approach was used to determine the level of significance at which gender, age, personality attributes and emotional intelligence of a driver affects his or her propensity to become angry on the road. All of the data in this study was analysed with the use of quantitative techniques. The techniques used to analyse the data that was gathered (item analysis and structural equation modelling) will now be discussed.

3.9.2 Computer package

Item analysis and partial least squares (PLS) analysis were applied to the collected data. Statistica version 12 was utilised in order to perform item analyses, which were necessary to provide the reliabilities of items and constructs identified. Path coefficients between variables were investigated using SmartPLS version 3; this computer package tested the relationships between the variables in the study (Langenhoven, 2015).

3.9.3 Item analysis

The main purpose of item analysis is to identify whether the items within the instruments used to measure the variables truly represent the dependent and independent variables. A number of measurement instruments have been discussed, each of which contains various items. These items are the elements in the instrument that gathers the information or data to be analysed. For this reason it was critical for these items to be a valid reflection of the variables. If these items were

not valid, they would not successfully determine the stance that drivers would have on the various aspects of the study.

One advantage is that item analysis indicates which items are poor, i.e. a weak representation of the variable, and which items are good. Those items that are seen as poor could cause a deficiency in differentiation between the various standpoints that dissimilar individuals would have on the variables in the study. A poor item will also not reveal a common latent variable in combination with the other items (Theron, 2013).

All measurement instruments that were determined for the variables in the structural model had to go through the item analysis process, because each one of these had a number of items that would be relevant for the researcher to receive the most accurate and useful information. This was also useful for getting rid of those items that did not effectively 'fit into' the variable.

As said before, item analysis is useful in determining poor items within each of the instruments. Based on these poor items, it could be established which items should be removed from the various measurements and questionnaires; however, these can only be removed once the various cut-off scores have been determined. Research suggests that reliabilities (Cronbach's alphas) of .70 or higher are satisfactory. Depending on the results of the item analysis and the nature of the poor items, the choice should be made to either transform or delete items from the instrument. If the alpha of the entire measurement instrument (overall reliability) increases when these items are deleted then the items should be removed or considered to be removed from the instrument/scale (Theron, 2014).

3.9.4 Structural equation modelling (SEM): Partial least squares (PLS)

Structural equation modelling is a powerful, multivariate analysis procedure that can be used to test the paths within the formulated structural model, as well as to determine whether the covariance matrix fits the structural model. As correlations were being tested, it was critical that we test the fit of the structural model in order to make inferences about the set out hypotheses.

When using structural equation modelling (SEM), researchers have a choice between covariance SEM and partial least squares (PLS) path modelling. PLS was used in the current study and is a soft modelling approach (compared to covariance SEM, which uses maximum likelihood). In contrast to covariance SEM, PLS is a prediction-orientated approach that aims at maximising latent

variables' explained variance (Hair, Ringle & Sarstedt, 2012). The PLS statistical method was useful here for its explorative and predictive nature, instead of the confirmatory nature of covariance SEM (Henseler, Ringle & Sinkovics, 2009).

Furthermore, PLS is extremely suitable to test and validate exploratory models, as the recommendation is to utilise this method in the early stages of theoretical development (Hair et al., 2012). PLS was particularly important in this study, as the sample size of the completed responses was small. If covariance SEM had been used, the sample size would have been problematic; the PLS method has been found to have high statistical power with smaller sample sizes (Hair et al., 2012).

Another advantage of the PLS method is that it is not influenced by the distribution of the data, i.e. this method can accommodate both reflective and formative scales. This is something that covariance SEM fails to do (Chin, 1998). PLS models consist of two linear equations, namely the inner model (can be compared to the structural model that is used in SEM) and the outer model (can be compared to the measurement model used in SEM) (Henseler et al., 2009). However, before the PLS model estimation could be conducted and analysed, various analyses had to take place first.

Composite reliabilities are considered as the first step. This evaluates the reliability of the latent variables necessary to estimate measurement model fit; average variance extracted (AVE) and R squared were analysed for this purpose. The reliability coefficients have to be greater than .70 for them to be regarded as satisfactory (Langenhoven, 2015). Once the reliabilities have been evaluated, the PLS estimates shed light on the measurement model's validity and reliability. The structural model estimates have to be investigated once the latent variable scores prove to be sufficiently reliable and valid (Chin, 1998). An important consideration is that the structural paths usually are more accurate than the reliability scores for the estimated constructs (Langenhoven, 2015).

3.10 RESEARCH ETHICS

It is of critical importance to protect the dignity, well-being and human rights of research participants in a study. The researcher had been informed of professional ethical codes and guidelines that were applicable to the research in this study. This study is considered a low-risk

study, with no potential risks related to it. The biggest concern was the anonymity of the research participants. Furthermore, the research participants were informed that no negative consequences would extend from the completion or incompletion of the survey. Therefore, ensuring completed responses are only used for the purposes of this specific study and that only the researcher, the supervisor and the statistical analyst had access to the completed responses. The survey data was protected with a secure username and password. Anonymity was guaranteed and the participants were allowed to terminate and exit the questionnaire at any time. Any concerns that developed from the participants' side were addressed by the researcher before the questionnaire was completed.

Before the survey commenced, research participants were informed of the following:

- 1) The objectives and purpose of the study
- 2) What participation in the study would involve
- 3) That confidentiality would be ensured at all times
- 4) Withdrawal from the study would not have consequences
- 5) Who the researcher was
- 6) What would happen with the results
- 7) How to go about dealing with enquiries about the survey
- 8) What their rights were regarding the study

The respondents were given the option to consent to participation in the study. Without this consent, the survey would not have commenced. The following statements for consent were addressed:

- “I understand the purpose of this study”
- “I know and understand what my rights are by participating in this study”
- “I consent to voluntarily take part in this study”
- “I understand that I can withdraw from this study without negative consequences”

Furthermore, the participants were provided with the contact details of a qualified professional who could be contacted if they had any further concerns. It is believed that there were no major ethical risks with the completion of the survey.

3.11 CHAPTER SUMMARY

Chapter 3 has presented a description of the methodologies used in the research study in order to answer the research-initiating question and resulting hypotheses. To summarise, the research design used was an *ex post facto* correlational design; this was used to collect data specifically for the purpose of the current research study. *Convenience sampling* (as well as elements of *stratified random sampling*) was used to select a sample population. Quantitative data collection methods were used to obtain information from professional and non-professional drivers. An electronic, online survey was distributed to Pepkor and Lube Marketing employees, together with social media and networking strategies. The following measurement instruments were used:

- International Personality Item Pool (IPIP) (Dahlen et al., 2006)
- Schutte Emotional Intelligence Scale (SEIS) (Davies et al., 2010)
- Driving Anger Scale (DAS) (Deffenbacher et al., 1994)

Item analysis and partial least squares (PLS) analysis were employed to analyse the data that was collected. Chapter 4 presents and discusses the research findings resulting from the statistical analysis.

CHAPTER 4

RESULTS

4.1 INTRODUCTION

This chapter presents the results obtained by analysing the data according to the statistical methods discussed in Chapter 3. Item analysis was utilised to test the reliability of the various measures used to investigate the latent variables. Next, the PLS (SEM) was used to support these findings; the reliability of the different measurement instruments was confirmed, and the fit of the measurement model was confirmed using PLS (SEM). This computer package was also used to investigate the paths and the relationships between dependent and independent variables in order to confirm the structural model fit.

The purpose of Chapter 4 is to present and discuss the different analyses that were executed in this study of driving anger. Firstly, the psychometric soundness of the measurement tools used was investigated using item analysis. Secondly, confirmatory factor analysis (CFA) was performed in order to test the measurement model fit. Finally, the resultant scores and hypotheses were interpreted.

4.2 VALIDATING THE MEASUREMENT MODEL

4.2.1 Item analysis

Item analysis provides an initial indication of the value of the statistical analysis performed. Validity and reliability criteria depend on the nature of the constructs within the study; the validity and reliability criteria were satisfactory, with Cronbach's alphas at 0.70 or more (Langenhoven, 2015). This being said, item correlations were used to investigate the consistency between items in the measurement tools. Inter-item correlations are a subtype of reliability, specifically internal consistency reliability. Values between 1.00 and > 0.50 were considered excellent; acceptable reliability was found between values of 0.50 and > 0.00 (Tabachnick & Fidell, 2013).

All of the items within the questionnaire were analysed using item analysis. Table 4.1 presents a summary of the items that measure each sub-dimension of the constructs. The summary includes

the mean, standard deviation, Cronbach's alphas, as well as the inter-item correlation of the items measuring the subscales. Table 4.2 provides a summary of the mean, standard deviation, Cronbach's alphas and the inter-item correlation of the total scales.

Table 4.1

Means, Standard Deviations and Internal Consistency Reliabilities of Subscales

Scale	Sample size	Number of items	Mean	Standard deviation	Cronbach's alpha	Average inter-item correlation
PER_AGR	199	10	39.80	5.78	.78	.29
PER_CON	199	10	38.96	6.3	.80	.29
PER_NEU	199	10	32.29	6.94	.82	.31
PER_OPE	199	10	36.63	5.41	.74	.23
PER_EXT	199	10	31.65	7.15	.84	.34
DAS	199	14	42.24	9.46	.84	.28
EQ	199	33	122.38	13.26	.88	.20

PER = Personality; AGR = Agreeableness; CON = Conscientiousness; NEU = Neuroticism; OPE = Openness to experience; EXT = Extraversion; DAS = Driving anger; EQ = Emotional intelligence

4.2.1.1 Personality

The personality scale, International Personality Item Pool (IPIP), consists of five subscales, namely agreeableness, conscientiousness, neuroticism, openness to experience and extraversion. The first subscale, 'agreeableness' (PER_AGR), obtained a Cronbach's alpha of .78, indicating high reliability. The inter-item correlation of .29 was slightly low, yet still acceptable. The Cronbach's alpha and inter-item correlation indicated that internal consistency reliability was satisfactory. The

individual inter-item correlations in this subscale ranged from .27 to .64, which is acceptable. Most of the items within the ‘agreeableness’ subscale did not affect the Cronbach’s alpha negatively, although the deletion of the item named ‘personality 2’ would cause the reliability coefficient to increase to .80. However, because the Cronbach’s alpha was $> .7$ and very close to .80, the deletion of this item was not warranted. These results indicate that ‘agreeableness’ as a subscale of the IPIP measured what it was supposed to measure.

The second subscale, ‘conscientiousness’ (PER_CON), obtained a Cronbach’s alpha of .8, which indicates excellent reliability. The average inter-item correlation for conscientiousness was .29. Even though this was low, it supports the satisfactory internal consistency of the subscale. The inter-item correlations of the individual items ranged between .35 and .60. Although ‘personality 33’ and ‘personality 48’ produced inter-item correlations of .35, these were still acceptable. Furthermore, none of the individual items in this scale affected the Cronbach’s alpha negatively, thus did not warrant the deletion of any of these items.

The third subscale, ‘neuroticism’ (PER_NEU), obtained a Cronbach’s alpha of .82, indicating excellent internal consistency. The average inter-item correlation was found to be .31, and even though this was slightly below .5, it was still deemed as acceptable and corroborated the reliability findings of the Cronbach’s alpha. The inter-item correlation of individual items ranged between .33 and .60. None of the individual items negatively affected the Cronbach’s alpha reliability score, and therefore none of the items were deleted.

The fourth subscale, ‘openness to experience’ (PER_OPE), obtained a Cronbach’s alpha $> .70$ (PER_OPE = .74). The average inter-item correlation was the lowest of all the subscales, yet still satisfactory ($r = .23$), indicating satisfactory reliability. Again, the individual items did not impact the reliability scores negatively, therefore none of the individual factors were deleted. The inter-item correlations ranged between .29 and .50, where ‘personality 40’ obtained a score of .29 and ‘personality 35’ obtained an inter-item correlation score of .50. With satisfactory internal consistency reliability, it was proven that this subscale measures what it is supposed to measure.

The fifth and final subscale, ‘extraversion’ (PER_EXT), obtained a Cronbach’s alpha of .84; this indicates high internal consistency reliability. The average inter-item correlations for ‘extraversion’ were .34, which supports the Cronbach’s alpha and therefore indicates acceptable

reliability. Items in this subscale did not affect the reliability coefficient negatively, and therefore did not warrant the deletion of any of the items. Individual inter-item correlations ranged between .37 and .72.

In total, the IPIP and its five subscales, namely extraversion, agreeableness, conscientiousness, neuroticism and openness to experience, produced satisfactory internal consistency reliability scores (Cronbach's alphas $> .70$), indicating that the subscales measured what they were supposed to measure. No item deletion was necessary, as the Cronbach's alphas for these subscales were not negatively affected by the individual items.

4.2.1.2 Emotional intelligence

The emotional intelligence measure, the Schutte Emotional Intelligence Scale (SEIS), obtained a Cronbach's alpha of .88; this proves excellent internal consistency reliability. The average inter-item correlation was $< .50$ ($r = .20$), which was considered as acceptable. Regarding individual items, many of these items did not affect the reliability score negatively; that being said, 'EQ 28' produced a Cronbach's alpha of 0.90 if deleted. The mean inter-item correlation was not satisfactory for this item, at -0.11, where an acceptable inter-item correlation would be between 0.50 and > 0.00 . Because the increase in the Cronbach's alpha would have been marginal it did not warrant the deletion of this item. The overall reliability score of this measure was satisfactory enough to be included in the study.

4.2.1.3 Driving anger

The Driving Anger Scale (DAS) measured the participant's self-reported tendency to become angry on the road. The DAS obtained a Cronbach's alpha of .84, which is greater than .70. This proves that there was high internal consistency reliability. The average inter-item correlation was acceptable at .28, corroborating the reliability findings of the Cronbach's alpha. Individual items did not negatively affect the reliability coefficient, and again no deletion of items was warranted. The inter-item correlations of the items ranged between .37 and .61, which was also acceptable (some were slightly less than 0.50). Hence, the DAS measures what it was supposed to measure.

4.2.1.4 Decision regarding the latent variable scales

The purpose of the item analysis was to evaluate the psychometric integrity of the indicator variables of the latent variables. Furthermore, with item analysis it was possible to investigate the functioning of each of the latent variables included in the study.

The results produced by the item analysis offered satisfactory evidence to support the inclusion of the individual items in the measurement tools. Many of the items were proven to be reliable and consistent at a satisfactory level, as all Cronbach's alpha coefficients were above .70. Considering item deletion, only a few items would have improved the Cronbach's alpha reliability coefficient; however, this would have been a marginal improvement and did not warrant the deletion of these individual items. It therefore was decided to retain all of the items. The average inter-item correlations of the measurement scales ranged between .20 and 0.34; even though there were lower than .50, the results were still acceptable.

It therefore can be concluded that the results extending from the item analysis were satisfactory. Hence, the subsequent analyses were performed and reported.

4.3 PARTIAL LEAST SQUARE (PLS) ANALYSES

PLS is said to be a strong approach for work intended to develop and refine theories (Robbins, 2012). The PLS approach to structural equation modelling should be used in a two-step process (Chin, 1998). Firstly, one has to evaluate the measurement model, followed by the evaluation of the structural model (structural component of the model). The purpose of the evaluation of the measurement model is to determine the quality of the construct used in the evaluation of the inner model.

Once the reliability of each of the latent variable scales has been identified, path coefficients are investigated in order to determine the significance (and strength) of the relationship that was hypothesised (Langenhoven, 2015). In other words, as the fit of the measurement model is proven, the significance of the paths between latent variables are tested, which is necessary to confirm the fit of the structural model.

4.3.1 Evaluation and interpretation of the measurement model

The purpose of the reliability analysis is to investigate the measurement model through an analysis of the reliability of the latent variable scales (Langenhoven, 2015); this is an extension of the

reliabilities (Cronbach's alphas) reported previously (M. Kidd, personal communication, June 15, 2016). In order to evaluate and interpret the reliabilities of each of the latent variables, composite reliability and average variance extracted (AVE) were used. Composite reliability values indicate whether the reliability of the latent variable scale is satisfactory or not. These composite reliability values need to be > 0.70 to be deemed satisfactory.

Most of the latent variables' scores of reliability were proven to be $> .70$, which means they were satisfactory; 'extraversion' (PER_EXT) was found to be $< .70$. This means that the reliability of this latent variable scale was not satisfactory. The AVE value investigates the amount of variance in the indicator variables, as explained by common factors. This score can be compared to other reliability scores, but it is a stricter measure of reliability (Langenhoven, 2015). Reliability scores of $> .50$ indicate that the variables indeed measure the relevant construct (Pennstate, 2015). All of the AVE value scores for the latent variables were $< .50$, which indicates that these constructs failed to explain 50% of the variance in the items. This is a possible limitation of the study. However, as mentioned, this is a stricter form of reliability testing. The reliability statistics can be found in Table 4.2 below.

Further analyses were performed in order to evaluate construct validity. Construct validity signifies the degree to which a scale measures what it is said to measure. The discriminant validity of each scale was investigated using the Fornell-Lacker criteria (Langenhoven, 2015). It is clear that all of the scales succeeded in proving that the constructs were unique and that there were no high correlations with the other constructs.

Table 4.2*Reliability Statistics of the PLS Model*

Scale	Average variance extracted (AVE)	Composite reliability
PER_AGR	.32	.81
PER_CON	.22	.72
PER_NEU	.38	.85
PER_OPE	.27	.77
PER_EXT	.14	.49
EQ	.23	.90
DAS	.33	.87

PER = Personality; AGR = Agreeableness; CON = Conscientiousness; NEU = Neuroticism; OPE = Openness to experience; EXT = Extraversion; DAS = Driving anger; EQ = Emotional intelligence

4.3.1.1 Outer loadings

A PLS bootstrap analysis was performed as the final item reliability test. PLS bootstrapping was conducted to determine whether or not item loadings were significant. Hence, the factor loadings were evaluated for this purpose. The factor loadings were investigated by identifying whether or not zero falls with the 95% confidence interval. If zero indeed falls within the interval, factor loadings would not be statistically significant, and vice versa.

Table 4.3 presents the strength of the relationships between the latent variables and the item in the survey that measures the variable. It can be concluded that the paths between items and their relevant latent variables, neuroticism and driving anger, were all statistically significant. These

results were indicated where zero did not fall within the 95% confidence interval. This corroborates the notion that these items were reliable in the latent variable scales.

Furthermore, the paths between agreeableness and its five items, conscientiousness and its eight items, openness to experience and its four items, and emotional intelligence and its five items, were found to be insignificant, indicating a problem with the measurement of the scale. The most problematic variable was that of extraversion; none of the paths between this latent variable and the measurement item proved to be significant. Moreover, the composite reliability of extraversion (PER_EXT) proved to be not satisfactory. The reliability of these measures, especially extraversion, could be questioned and was taken into account by the researcher when inferences were made based on these findings.

The aforementioned findings are summarized in Table 4.3 below.

Table 4.3

Outer loadings

Latent variables	Path	Original sample	95% confidence interval (lower)	95% confidence interval (upper)	Significant
Agreeableness	PER_AGR → Personality 12	0.545	0.264	0.81	Significant
	PER_AGR → Personality 17	0.709	0.305	0.849	Significant
	PER_AGR → Personality 2	0.19	-0.354	0.546	Not significant
	PER_AGR → Personality 22	0.339	-0.259	0.626	Not significant
	PER_AGR → Personality 27	0.461	-0.05	0.712	Not significant
	PER_AGR → Personality 32	0.495	-0.039	0.695	Not significant
	PER_AGR → Personality 37	0.697	0.42	0.861	Significant
	PER_AGR → Personality 42	0.776	0.575	0.875	Significant
	PER_AGR → Personality 47	0.685	0.505	0.871	Significant
	PER_AGR → Personality 7	0.497	-0.156	0.727	Not significant

Conscientiousness	PER_CON → Personality 13	0.439	-0.221	0.783	Not significant
	PER_CON → Personality 18	0.42	-0.196	0.762	Not significant
	PER_CON → Personality 23	0.463	-0.36	0.753	Not significant
	PER_CON → Personality 28	0.305	-0.37	0.66	Not significant
	PER_CON → Personality 3	0.558	-0.21	0.816	Not significant
	PER_CON → Personality 33	0.178	-0.685	0.627	Not significant
	PER_CON → Personality 38	0.75	0.595	0.903	Significant
	PER_CON → Personality 43	0.364	-0.558	0.688	Not significant
	PER_CON → Personality 48	0.557	0.121	0.878	Significant
	PER_CON → Personality 8	0.518	-0.209	0.782	Not significant
Neuroticism	PER_NEU → Personality 14	0.613	0.473	0.729	Significant
	PER_NEU → Personality 19	0.438	0.236	0.573	Significant
	PER_NEU → Personality 24	0.603	0.476	0.713	Significant
	PER_NEU → Personality 29	0.709	0.586	0.811	Significant
	PER_NEU → Personality 34	0.612	0.408	0.734	Significant
	PER_NEU → Personality 39	0.676	0.528	0.759	Significant
	PER_NEU → Personality 4	0.74	0.639	0.813	Significant
	PER_NEU → Personality 44	0.702	0.6	0.797	Significant
	PER_NEU → Personality 49	0.486	0.298	0.646	Significant
	PER_NEU → Personality 9	0.54	0.318	0.676	Significant
Openness to experience	PER_OPE → Personality 10	0.501	0.028	0.719	Significant
	PER_OPE → Personality 15	0.284	-0.2	0.566	Not significant
	PER_OPE → Personality 20	0.546	-0.012	0.768	Not significant
	PER_OPE → Personality 25	0.749	0.605	0.937	Significant

	PER_OPE → Personality 30	0.33	-0.379	0.62	Not significant
	PER_OPE → Personality 35	0.739	0.607	0.866	Significant
	PER_OPE → Personality 40	0.347	-0.149	0.606	Not significant
	PER_OPE → Personality 45	0.523	0.078	0.742	Significant
	PER_OPE → Personality 5	0.521	0.14	0.711	Significant
	PER_OPE → Personality 50	0.501	0.021	0.74	Significant
Extraversion	PER_EXT → Personality 1	0.587	-0.082	0.851	Not significant
	PER_EXT → Personality 11	-0.292	-0.884	0.3	Not significant
	PER_EXT → Personality 16	0.433	-0.178	0.776	Not significant
	PER_EXT → Personality 21	0.034	-0.753	0.453	Not significant
	PER_EXT → Personality 26	0.155	-0.574	0.519	Not significant
	PER_EXT → Personality 31	0.373	-0.685	0.727	Not significant
	PER_EXT → Personality 36	0.47	-0.001	0.823	Not significant
	PER_EXT → Personality 41	0.287	-0.61	0.616	Not significant
	PER_EXT → Personality 46	0.289	-0.627	0.652	Not significant
	PER_EXT → Personality 6	0.546	-0.051	0.814	Not significant
Emotional intelligence	Emotional intelligence → EQ 1	0.524	0.372	0.703	Significant
	Emotional intelligence → EQ 10	0.574	0.377	0.721	Significant
	Emotional intelligence → EQ 11	0.329	0.024	0.557	Significant
	Emotional intelligence → EQ 12	0.613	0.453	0.747	Significant
	Emotional intelligence → EQ 13	0.47	0.247	0.639	Significant
	Emotional intelligence → EQ 14	0.536	0.365	0.695	Significant
	Emotional intelligence → EQ 15	0.449	0.181	0.615	Significant
	Emotional intelligence → EQ 16	0.601	0.416	0.739	Significant

Emotional intelligence → EQ 17	0.534	0.384	0.689	Significant
Emotional intelligence → EQ 18	0.539	0.349	0.72	Significant
Emotional intelligence → EQ 19	0.48	0.301	0.665	Significant
Emotional intelligence → EQ 2	0.566	0.389	0.714	Significant
Emotional intelligence → EQ 20	0.44	0.17	0.625	Significant
Emotional intelligence → EQ 21	0.5	0.278	0.649	Significant
Emotional intelligence → EQ 22	0.665	0.552	0.783	Significant
Emotional intelligence → EQ 23	0.561	0.363	0.738	Significant
Emotional intelligence → EQ 24	0.593	0.454	0.719	Significant
Emotional intelligence → EQ 25	0.475	0.198	0.67	Significant
Emotional intelligence → EQ 26	0.476	0.197	0.65	Significant
Emotional intelligence → EQ 27	0.454	0.237	0.606	Significant
Emotional intelligence → EQ 28	-0.224	-0.508	0.084	Not significant
Emotional intelligence → EQ 29	0.233	-0.106	0.467	Not significant
Emotional intelligence → EQ 3	0.556	0.419	0.719	Significant
Emotional intelligence → EQ 30	0.474	0.211	0.67	Significant
Emotional intelligence → EQ 31	0.397	0.153	0.635	Significant
Emotional intelligence → EQ 32	0.539	0.337	0.708	Significant
Emotional intelligence → EQ 34	0.379	0.114	0.623	Significant
Emotional intelligence → EQ 4	0.396	0.143	0.597	Significant
Emotional intelligence → EQ 5	0.221	-0.084	0.464	Not significant
Emotional intelligence → EQ 6	0.39	0.179	0.592	Significant
Emotional intelligence → EQ 7	0.288	-0.013	0.489	Not significant
Emotional intelligence → EQ 8	0.406	0.115	0.599	Significant

	Emotional intelligence → EQ 9	0.624	0.456	0.766	Significant
Driving anger	DAS → Anger 1	0.467	0.253	0.631	Significant
	DAS → Anger 10	0.69	0.503	0.764	Significant
	DAS → Anger 11	0.554	0.409	0.673	Significant
	DAS → Anger 12	0.479	0.225	0.621	Significant
	DAS → Anger 13	0.536	0.343	0.66	Significant
	DAS → Anger 14	0.692	0.554	0.77	Significant
	DAS → Anger 2	0.546	0.402	0.655	Significant
	DAS → Anger 3	0.546	0.373	0.659	Significant
	DAS → Anger 4	0.456	0.265	0.594	Significant
	DAS → Anger 5	0.498	0.265	0.635	Significant
	DAS → Anger 6	0.603	0.469	0.698	Significant
	DAS → Anger 7	0.738	0.639	0.805	Significant
	DAS → Anger 8	0.605	0.444	0.703	Significant
	DAS → Anger 9	0.604	0.416	0.692	Significant
PER = Personality; AGR = Agreeableness; CON = Conscientiousness; NEU = Neuroticism; OPE = Openness to experience; EXT = Extraversion; DAS = Driving anger					

To conclude, the results indicate that a number of latent variables were deemed statistically significant. Extraversion proved to be the most problematic. As mentioned, these findings were taken into consideration when inferences were made.

4.3.2 Evaluation and interpretation of the structural model

The structural model was analysed in order to establish the quality of the relationships between the latent variables that were used in the study. The purpose of the PLS structural model analysis is to determine the extent to which the latent variables are related to each other. Furthermore, the relationship and influence of the dependent and independent variables were analysed. The

structural model can also be referred to as the ‘inner model’, since it considers the factors inside the structural model. The structural model analysis included the testing of multi-collinearity, analysing the R squares, and evaluating the main effects together with the moderating effects.

4.3.2.1 Multi-collinearity

When performing regression analysis, many of predictor variables are present and one should then assume that all of the predictor variables are uncorrelated with one another. More often than not, predictors correlate with each other too high, which results in unstable regressions determined by estimated coefficients. The researcher analysed multi-collinearity by using the variance inflation factor (VIF).

The variance inflation factor determines the amount of variance of the estimated regression coefficient that is inflated, compared to when the predictor variables are not linearly related. This provides information necessary to describe the amount of correlation between predictors in the regression analysis (multi-collinearity). It is important to note that multi-collinearity is problematic, as it can increase the variance of the regression coefficients; this results in the regression coefficients possibly being unstable and increases the difficulty of interpretation.

There are various recommendations for acceptable results of VIF. A value of 10 has been recommended most commonly as the maximum level of VIF. However, further research has indicated that a maximum value of 5 would be ideal (Pennstate, 2015). One can assume that researchers use whichever criterion would help serve their own purposes. In the current study, a maximum VIF value of 5 or higher was considered to be problematic (Kidd, personal communication, June 15, 2016). Furthermore, it was found that all of the scores were below 5; hence there was no indication of multi-collinearity problems.

4.3.2.2 Evaluation and interpretation of the R square

The R square value evaluates the amount of variance in the endogenous variable that is explained by the exogenous variables. Table 4.4 below illustrates the R square scores for the endogenous variable.

Table 4.4***R Squares Scores for the Endogenous Variable***

	R square
Driving anger	.313

Driving anger as an endogenous variable (dependent variable) obtained an R square value of .313. This means that only 31% of the variance was explained by the exogenous variables. This low score is an indication that there are other possible variables that could have a greater impact on the endogenous variable which were not included and measured in this study. This low score is a possible limitation of the study and will be discussed in detail in the next chapter.

4.3.2.3 Evaluation and interpretation of the main effects

An important consideration to take into account is that PSL path modelling is not implemented to test theory, but instead to facilitate prediction (Henseler et al., 2009). Once the reliability of the various latent variable scales was determined, path coefficients were analysed in order to determine the significance and strength of the hypothesised relationships. In order to determine the relationships between variables, the bootstrapping method was used. According to this method, if zero falls within the confidence interval, the related coefficient will be seen as not significant, and vice versa.

Table 4.5 below indicates whether the path coefficients were significant or not. For the researcher to determine the strength and significance of the hypothesised paths proposed in the structural model (Figure 3.1), the path coefficients were investigated by evaluating whether zero fell within the 95% confidence interval. Furthermore, the significance of the path coefficients was analysed and, on this basis, information was provided on the hypothesised paths and their significance.

Table 4.5***Path Coefficients between Variables***

Path	Path coefficient	95% confidence interval (lower)	95% confidence interval (upper)	Description
H1: PER_AGR – DAS	0.024	-0.183	0.187	Not significant
H2: PER_CON – DAS	0.019	-0.199	0.268	Not significant
H3: PER_NEU – DAS	-0.343	-0.452	-0.174	Significant
H4: PER_OPE – DAS	-0.184	-0.291	0.04	Not significant
H5: PER_EXT – DAS	0.343	-0.347	0.433	Not significant
H6: EQ – DAS	-0.067	-0.281	0.118	Not significant

PER = Personality; AGR = Agreeableness; CON = Conscientiousness; NEU = Neuroticism; OPE = Openness to experience; EXT = Extraversion; EQ = Emotional intelligence; DAS = Driving anger

Hypothesis 1: A negative relationship exists between agreeableness (ξ_1) and driving anger (η_1).

The hypothesised negative relationship between agreeableness and driving anger was found to be *not significant* (PLS path coefficient = 0.024), with zero falling within the 95% confidence interval. These findings were in contrast with existing research on the relationship between agreeableness and driving anger (Cellar, Nelson, & Yorke, 2000; Dahlen et al., 2006). Jovanovića et al. (2011) found similar results to most research conducted, where agreeableness had a strong significant, negative relationship with driving anger. However, the findings of this study imply that whether an individual has high or low levels of agreeableness it does not influence his/her tendency to experience driving anger. It can be concluded that individuals high on agreeableness may still be likely to show driving anger.

Hypothesis 2: A negative relationship exists between conscientiousness (ξ_2) and driving anger (η_1).

The hypothesised negative relationship between conscientiousness and driving anger was found to be *not significant*. The PLS path coefficient was equal to 0.019, with zero falling within the 95% confidence interval. Again, this is in contrast to existing research (Bone & Mowen, 2006; Dahlen et al., 2006; Jovanovića et al., 2011). However, Cellar et al. (2000) found similar results, in that conscientiousness had no relationship to driving behaviours; the reason suggested for these findings was the average age of the participants (20 years old).

According to the results of this study, it is clear that those who experience driving anger could have high or low levels of conscientiousness. In other words, the level of conscientiousness does not affect a driver's propensity to become angry behind the wheel. As a limitation of the study, which will be discussed in the next chapter, the items that proved to have an insignificant relationship with the variable could have had an effect on the understanding and final outcome of the sub-dimension of the measure.

Hypothesis 3: A positive relationship exists between neuroticism (ξ_3) and driving anger (η_1).

The hypothesised positive relationship between neuroticism and driving anger was found to be *statistically significant* (PLS path coefficient = -0.343), with zero not falling within the 95% confidence interval. The opposite of neuroticism is emotional stability; emotional stability is often used as the label for this variable in the big five. Hence, the results indicate a negative relationship between emotional stability and driving anger.

Drivers who score high on emotional stability are less likely to experience driving anger; the same is assumed for neuroticism – those who score high on neuroticism are more likely to experience driving anger. This corroborates existing research that states that the extent of emotional stability (or neuroticism) will affect a driver's tendency to experience anger behind the wheel (Bone & Mowen, 2006; Dahlen et al., 2006; Jovanovića et al., 2011).

Hypothesis 4: A negative relationship exists between openness to experience (ξ_4) and driving anger (η_1).

The hypothesised negative relationship between openness to experience and driving anger was found to be *not significant* (PLS path coefficient = -0.184), with zero falling within the 95%

confidence interval. Even though the results proved that there is a negative relationship between openness to experience and driving anger, the relationship between the two variables was insignificant. These findings are similar to those in the existing literature, which found weak relationships between openness to experience and driving anger (Cellar et al., 2000; Jovanovića et al., 2011). The findings imply that those drivers who score high on openness to experience could experience anger on the roads, or not. Openness to experience does not affect the propensity to experience driving anger.

Hypothesis 5: A positive relationship exists between extraversion (ξ_5) and driving anger (η_1).

The hypothesised positive relationship between extraversion and driving anger was found to be *not significant*. The PLS coefficient was equal to 0.343, with zero falling within the 95% confidence interval. This corresponds with other literature studies in that only partial support was found for the relationship between extraversion and driving anger (Dahlen et al., 2012; Jovanovića et al., 2011). Therefore, driving anger is most likely not affected by the driver's score on extraversion.

This finding could be because of the paths between this variable and the items in the measurement scale being insignificant. None of the items had a significant relationship with extraversion; this poor relationship between the items and the measurement scale could fail to provide an accurate indication of the extent to which individuals score on extraversion. Furthermore, the low AVE score of the extraversion sub-dimension should also be taken into account when making inferences.

Hypothesis 6: A negative relationship exists between emotional intelligence (ξ_6) and driving anger (η_1).

The hypothesised negative relationship between emotional intelligence and driving anger was found to be *not statistically significant* (PLS path coefficient equal to -0.067), with zero falling within the 95% confidence interval. Only a limited amount of research has found a significant relationship between emotional intelligence and driving behaviours. Arnau-Sabates et al. (2012) have found a relationship between emotional intelligence and risky driving behaviours (which can extend from driving anger). These findings therefore imply that drivers could have high levels of

emotional intelligence and low levels of emotional intelligence; these scores will not affect the propensity to experience driving anger. In other word, individuals who score high on emotional intelligence could also experience driving anger.

It is important to note that not all of the items in the item analysis had a significant relationship with this construct. This should be taken into consideration when making inferences regarding driving anger and emotional intelligence. The low AVE results for this scale should also be considered when making inferences.

4.3.2.4 Evaluating and interpreting the proposed moderating hypotheses

Both gender and age were tested as moderating variables according to the hypothesis developed. Gender as a moderator and its relevant hypotheses are presented and discussed below.

Hypothesis 7: Gender has a moderating effect on the relationship between agreeableness and driving anger ($\eta 1$).

Hypothesis 8: Gender has a moderating effect ($\xi 8$) on the relationship between conscientiousness and driving anger ($\eta 1$).

Hypothesis 9: Gender has a moderating effect ($\xi 9$) on the relationship between neuroticism and driving anger ($\eta 1$).

Hypothesis 10: Gender has a moderating effect ($\xi 10$) on the relationship between openness to experience and driving anger.

Hypothesis 11: Gender has a moderating effect ($\xi 11$) on the relationship between extraversion and driving anger.

Hypothesis 12: Gender has a moderating effect ($\xi 12$) on the relationship between emotional intelligence and driving anger.

The hypothesised moderating effect of gender on the relationship between agreeableness, conscientiousness, neuroticism, openness to experience, extraversion, emotional intelligence and driving anger was *found not to be statistically significant*. These findings are based on the p-values provided; these evaluate whether moderating effects exist between paths. It is important to note that $p < .05$ is statistically significant at the 95% confidence interval. The p-values and interaction

coefficients are provided in Table 4.6. The data therefore shows no evidence of gender as a moderator ($p > 0.05$). Future research could explore this phenomenon further.

Table 4.6

P-values for Gender as Moderating Effect

Path	Interaction coefficient	P-value
H7: GENDER*PER_AGR – DAS	0.031	0.883
H8: GENDER*PER_CON – DAS	0.305	0.24
H9: GENDER*PER_NEU – DAS	0.085	0.541
H10: GENDER*PER_OPE – DAS	0.15	0.527
H11: GENDER*PER_EXT – DAS	0.134	0.708
H12: GENDER*EQ – DAS	0.034	0.864

PER = Personality; AGR = Agreeableness; CON = Conscientiousness; NEU = Neuroticism; OPE = Openness to experience; EXT = Extraversion; EQ = Emotional intelligence; DAS = Driving anger

Hypothesis 13: Age has a moderating effect (ξ_{13}) on the relationship between agreeableness and driving anger.

Hypothesis 14: Age has a moderating effect (ξ_{14}) on the relationship between conscientiousness and driving anger.

Hypothesis 15: Age has a moderating effect (ξ_{15}) on the relationship between neuroticism and driving anger.

Hypothesis 16: Age has a moderating effect (ξ_{16}) on the relationship between openness to experience and driving anger.

Hypothesis 17: Age has a moderating effect (ξ_{17}) on the relationship between extraversion and driving anger.

Hypothesis 18: Age has a moderating effect (ξ_{18}) on the relationship between emotional intelligence and driving anger.

The hypothesised moderating effect of age on the relationship between agreeableness, conscientiousness, neuroticism, openness to experience, extraversion, emotional intelligence and driving anger was *found not to be statistically significant* ($p > 0.05$). Table 4.7 below presents hypotheses 13 to 18 and the p-values respectively. Conscientiousness, neuroticism, openness to experience, extraversion and emotional intelligence had p-values $> .05$, whereas agreeableness showed some tendency for a moderation effect to occur, with the p-value quite close to .05. It therefore can be assumed that there is an inclination for age to moderate the relationship between agreeableness and driving anger. However, this is not statistically significant. The data thus shows no evidence of age as a moderator, but only a tendency for the mentioned relationship to occur. This can be explored for future research purposes.

Table 4.7

P-values for Age as Moderating Effects

Path	Interaction coefficient	P-value
H13: AGE*PER_AGR – DAS	-0.114	0.17
H14: AGE*PER_CON – DAS	0.011	0.89
H15: AGE*PER_NEU – DAS	-0.02	0.76
H16: AGE*PER_OPE – DAS	-0.085	0.22
H17: AGE*PER_EXT – DAS	-0.046	0.58
H18: AGE*EQ – DAS	0.032	0.69

PER = Personality; AGR = Agreeableness; CON = Conscientiousness; NEU = Neuroticism; OPE = Openness to experience; EXT = Extraversion; EQ = Emotional intelligence; DAS = Driving anger

Existing research regarding gender and age and their influences on driving anger tends to prove both a significant relationship as well as an insignificant relationship between these variables. Bone and Mowen (2006) found no relationship between gender and aggressive drivers; whereas Jovanovic et al. (2012) proved that older drivers reported more anger on the roads, and that female driver's experience greater anger when provoked by reckless drivers. Bogdan et al. (2016) also found results indicating that females experience more anger than males, and that younger individuals experience more anger. These variables remain important considerations for driving anger and should be included in future research initiatives.

4.4 CHAPTER SUMMARY

The purpose of this chapter was to report on and discuss the findings of the data collection. The measurement model was validated by performing item analyses on each of the measurement tools necessary to establish the reliability of the items within the questionnaires. PLS also was used to evaluate the reliability of the items in each measurement scale used to measure the latent variables in this study. Following these analyses, the structural model was tested in order to determine the quality of the relationships between the latent variables that were utilised in the questionnaires. Finally, the scores and hypothesised relationships (main effects as well as moderating effects) were interpreted and discussed.

Paths between agreeableness, conscientiousness, openness to experience, extraversion and emotional intelligence, and the dimensions, indicated a number of problems with the scales. Many of these had a number of insignificant relationships; however, extraversion had no items with significant relationships with this variable. Thus, along with the low AVE score, the reliability of extraversion as a sub-scale is questioned. Furthermore, no individual items were removed subsequent to the CFA, which was conducted for the purpose of interpreting the results as gathered by the research survey. The researcher wanted to avoid influencing any of the results, for example by deleting items or adapting measurement model fit.

Of the 18 hypotheses formulated in the study, one was found to be significant. It is important to note that, of the non-significant paths, 12 were related to moderating effects. Hypotheses 1, 2, 4, 5 and 6 were also found to be *not significant*. These insignificant results could be due to many reasons. That being said, hypothesis 3 was found to be statistically significant. This implies that those high on neuroticism are most likely to experience driving anger.

Chapter 5 will present the managerial implications of the study to assist South African industrial psychologists, managers and organisations to address the issue of driving anger amongst professional and non-professional drivers. The limitations of this study will be outlined, together with recommendations for future research endeavours.

CHAPTER 5

IMPLICATIONS, LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

5.1 INTRODUCTION

Chapter 1 aimed to contextualise the study and provided an overview of the research-initiating question, together with the research objectives. Chapter 2 provided a detailed literature review of the relevant variables included in the study, while at the same time deriving hypotheses from the literature study. Chapter 3 explained the methodology, the sample and the statistical analyses that were done in the study. Chapter 4 presented and discussed the results, participant scores and conclusions from the hypotheses.

This final chapter highlights managerial implications to assist South African industrial psychologists, managers and especially business make use of transport methods to complete daily activities. Problems will be addressed that extend from the findings in Chapter 4. As mentioned in Chapter 1, the objectives that will be addressed in this chapter are: "... suggest implications for professional drivers in industry; and identify other major determinants of driving anger as recommendations for future research in the area of traffic psychology, which has not yet been considered previously". Furthermore, the limitations of the study will be presented.

Throughout the study it became clear that driver behaviour, and specifically driving anger, are the result of intricate interactions. The driver behaviour model, presented in Chapter 1 (Figure 1.1), illustrates the complex nature of the driving environment, where internal and external factors affect one another and, in turn, affect traffic safety and consequences. This conceptual model was used to illustrate the relationship that individual driver characteristics (specifically driving anger) have with the larger system of traffic psychology.

Hagenzieker (2014) states that more attention is being placed on traffic psychology as a holistic system, since vehicle accidents are a result of an integral road system adapted to human capabilities and limitations. Furthermore, Bax, Leroy and Hagenzieker (2014) emphasise the need to consider institutional, governmental as well as individual interventions and adaptations in order to bring about

change within the traffic safety environment. These suggestions are corroborated by Hakkert and Gitelman (2014), who state that progress in road safety is mostly attributed to the development and implementation of countermeasures associated with infrastructure, vehicle adaptation and road user behaviours.

As illustrated in Chapter 1 (Figure 1.1), road safety is an outcome or consequence of the holistic traffic system working together. Road safety and traffic psychology form part of the relevance of this study, especially in an organisational context (professional drivers). Research has identified driving as one of the most risky activities during an individual's work day (Wishart, Somoray & Rowland, 2017). This being said, organisations fail to effectively manage the risks that accompany work-related driving; this is in comparison to other workplace hazards. Organisations should acknowledge their responsibility in the role of protecting their employees whilst they drive for work purposes (Wishart et al., 2017). There are a number of implications and interventions that could be applied in the work environment in order to keep drivers safe. Practical implications and possible interventions (specifically for professional drivers) will be discussed in the next section.

5.2 PRACTICAL IMPLICATIONS

Quantitative research, in which the relationships between variables are proven to be significant, is of great value to industrial psychologists as well as organisations. Even though the PLS path analysis did not prove many significant relationships, this provides valuable information on the environment of professional drivers. A total of 31% of variance was accounted for in driving anger, which could be attributed to the fact that there are many factors influencing driving behaviours that were not included in the study. This also adds to the suggestion that traffic psychology and driving behaviours comprise a complex nomological network of internal as well as external variables. There is no doubt that value has been added to the study of driving anger in the professional driver environment.

It therefore is important to focus on the aspect of driving anger, as well as other general driving behaviours, in professional drivers. As individual and organisational outcomes, driving behaviours could have a major impact of the daily operation of all business, and in the same instance on the driver himself. Hence, it is critical for managers and industrial psychologists to consider interventions to decrease driving anger (and other negative driving behaviours), and to protect employees who make use of the roads to complete work tasks. This section is therefore divided

into 1) general implications of not only driving anger, but traffic safety and other driving behaviours, and 2) implications and organisational level interventions specific to this study (considering variables in this study)

5.2.1 General implications for professionals and non-professional drivers

The epidemic of road accidents has become an international conundrum that affects all individuals directly. According to the World Health Organization (WHO), and as mentioned previously, injuries stemming from traffic accidents are significant causes of deaths internationally (Amponsah-Tawaih & Mensah, 2016). The driver behaviour model in Chapter 1 illustrates how driving anger fits within the wider system of traffic safety. There are many individual characteristics that interact with external factors, which then affect traffic accidents. Hence, traffic accidents as a consequence (and organisational outcomes) will be used throughout this chapter in order to develop organisational, individual and/or governmental level interventions. This section focuses on the wider model and the impact of external interventions on traffic safety (as shown in the behaviour model in Chapter 1, traffic safety is an outcome of external and internal factors influencing each other).

When considering governmental factors influencing driving anger and safety on the roads, it is important to note that a safe driving culture has to be created and emphasised nationally. A safe driving culture is mostly dependent on government's responsibility to enforce rules and regulations. In creating a safe traffic culture, laws and regulations need to be used to monitor occurrences and behaviour on the roads. It is said that the economic status of the country has an impact on aspects such as infrastructure, vehicle safety, awareness programmes, etc. Factors such as law enforcement can only extend from governmental actions and laws (Somazer, Uzumcuoglu & Özkan, 2016). A developing country may have less 'manpower' in law enforcement than a developed country. Therefore, law enforcement on aspects such as speed regulation are limited by the number of traffic officers available. Therefore, it is government's responsibility to invest in traffic safety programmes, laws to regulate reckless driving, as well as awareness programmes on what is acceptable and what is not acceptable (Somazer et al., 2016).

Further governmental initiatives could be improving road infrastructure. As mentioned, a government's economic status is among the most influential variables affecting traffic safety. This status would determine road construction initiatives, public transport, etc. Initiatives by

government could include aspects such as cameras along dangerous areas, monitoring driving behaviours, increased number of speed cameras, etc. With regard to monetary investments in road safety, there should be helplines for drivers. These helplines could address aspects such as reporting other drivers who drive illegally (speeding, under the influence, underage, reckless, aggressive, etc.) – this could act as support for law enforcement. Furthermore, the helpline could help those drivers who are in distress (counselling for those who experienced an aggressive driver, a fast link to the necessary authorities – police, ambulance, traffic officers, towing trucks, etc.).

Regarding vehicle technology and its effect on traffic safety and driving behaviours, one could look at vehicle manufacturers and emphasise the need for safer technology (Elvik, 2016; Purucker, Naujoks, Prill & Neukum, 2017). For example, vehicles could include features to adapt to the weather, like a limited speed when heavy rains occur, warnings on slippery roads as a result of snow or water, etc. Furthermore, vehicles could include speed-monitoring technology to notify the authorities of reckless manoeuvres or speeding (Wickens, Mann, Ianlomiteanu & Stoduto, 2016). One should then question whether this would be practical in the sense of car sales and so forth; this could then also be a government initiative, where regulations initiate these safety features.

Another broad type of intervention could be based on media initiatives (Sullman, Stephens & Yong, 2015), such as initiating campaigns in which safe and unsafe driving behaviours are identified, as well as the consequences. These interventions would tap into the emotions of media viewers. Expressing angry driving behaviour and the impact it could have on others' lives, as well as the safety of the angry drivers, is what the focus of the media campaign should be. Television, billboards, posters and radio are some of the media that could be used to improve safety on the roads.

These general implications and interventions have a broad focus on government, the economic status of the country, vehicle engineering, media, etc. The aspect of traffic safety and driving anger forms part of a wider, complex system. The next section focuses specifically on the variables of this study and the impact of driving anger interventions on professional drivers.

5.2.2 Implications aimed specifically at the results of the present study

This section discusses possible interventions that are feasible for organisations and professional drivers. In this study we assumed that professional and non-professional drivers display anger in a similar manner, one can use the results of this study to base inferences on. Research has found

shocking statistics regarding organisational injuries and fatalities due to traffic accidents amongst professional drivers (Chen, Fang, Guo & Hanowski, 2016). Hence, organisations should implement interventions that can enhance the culture of safety within the company.

5.2.2.1 Organisational level interventions

The WHO and various studies have stated that work-related road accidents are substantial causes of deaths in the workplace (Giroto, De Andrade & Gonzalez, 2016); similar results have been found in the USA (road accidents accounting for 35% of work-related injuries) and the European Union (road accidents accounting for 41% of work-related injuries) (Amponsah-Tawaih & Mensah, 2016). These statistics are corroborated by Wishart et al. (2017), who suggest that driving is one of the riskiest activities to perform as a job requirement. It therefore is important for a culture of safety to be instilled, not only in an organisational context, but nationally too.

A climate of safety climate, associated with the organisational climate, comprises the perceptions and expectations of employees regarding their working environment. A culture of safety therefore is measured according to the safety beliefs and practices instilled by the organisation (Amponsah-Tawaih & Mensah, 2016). Research states that employees' perception of the organisation's safety culture influences their work behaviours, specifically their safety behaviours. Furthermore, Amponsah-Tawaih and Mensah (2016) suggests that a culture of safety is linked to traffic accidents, as well as the frequency of involvement in occupational accidents.

A multicultural model of an organisational safety climate shows that employees are faced with demanding, challenging and ambiguous tasks (Amponsah-Tawaih & Mensah, 2016). Managers and leaders are responsible for policy implementation and regulations to which employees should adhere when completing these demanding tasks. However, it is problematic when leaders and managers are not consistent in the implementation of rules and regulations. When these complex task demands involve driving as a job requirement (and with the flexibility of some managers in the implementation of regulations), safe driving behaviours lack priority. This is especially true when leaders and managers differ in their implementation of safety regulations. Thus, the decision by drivers to take part in safe driving behaviour becomes compromised when they are faced with demanding, ambiguous tasks in an environment in which safety is not priority (Amponsah-Tawaih & Mensah, 2016).

The next section focuses specifically on the variables of this study. It considers interventions that could be implemented to foster a safe organisational culture using the variables in the study.

a) Fostering a safe culture through personality

The present study was motivated partially by the need to understand the role of personality traits and attitudes in accident risk, as well as the need for road safety interventions (especially in the context of professional drivers). A concern to take into consideration is that personality is a relatively stable human characteristic, which more often than not is even more rigid when it comes to road safety interventions (Mallia et al., 2015). A number of studies have revealed that personality traits in relation to traffic safety predict deviant driving behaviours and crash involvement. Nonetheless, very few studies have focused their investigation on professional drivers. The studies that have been conducted indeed prove that personality attributes play an important role in predicting accident involvement amongst professional (and non-professional) drivers) (Mallia et al., 2015).

The Five Factor model used in this study consists of the factors agreeableness, conscientiousness, neuroticism, openness to experience and extraversion. This model is said to be a comprehensive but prudent organising framework of personality (Barford & Smillie, 2016). Within the measure used (IPIP), these broad domains were assumed to have narrower traits and items. The objective of this measure was to identify the relationship between these broad dimensions and driving anger.

Considering agreeableness (PLS = 0.024), conscientiousness (PLS = 0.019), openness to experience (PLS = -0.184) and extraversion (PLS = 0.343), the hypothesised relationships between these personality traits and driving anger was found to be statistically *not significant*. Possible reasons for this could be that the items in these sub-dimensions did not all have a significant relationship with the construct they were measuring. The biggest issue was with extraversion, due to the items having a statically insignificant relationship with extraversion as a construct. These findings will be discussed further in the next section.

With regard to neuroticism/emotional stability, the hypothesised positive relationship between neuroticism and driving anger was found to be statistically *significant*, with a PLS path coefficient equal to -0.343. As mentioned during the analysis, the term emotional stability was used, hence the negative relationship result; this remains in line with the hypothesis developed. This finding presents a strong relationship between neuroticism/emotional stability and driving anger. Even

though only one of the five personality dimensions was found to have a relationship with driving anger, it is still important to include all five traits when considering interventions. All personality traits will be evident in the workplace in some way.

Based on these findings, possible interventions regarding personality and driving anger amongst professional drivers should be at an individual level, where organisations can implement training to improve the manner in which professional drivers deal with anger (in general as well as on the road) (Sullman et al., 2015). Because personality is relatively consistent, it is important for organisations to create awareness of driving anger in the workplace. Once professional drivers are aware of their tendencies, they will have motivation to change. Where the motivation to change is present, training interventions are most effective. Industrial psychologists can attempt to improve reactions to anger-inducing situations, with the focus being on emotional stability. It was mentioned previously that those low on emotional stability/high on neuroticism experience anxiety, anger and are quick to get upset; training interventions could then focus on how to be less sensitive, use techniques to identify the root of the anger, etc.

Furthermore, and as mentioned previously, professional driving is a demanding task in which work stress is extended to the road. Organisations should bear in mind that, if the anxiety and stress (neuroticism) extend from the workplace, interventions should include decreasing stress and providing training in which the professional driver can learn to cope better with job demands and stresses. If a professional driver experiences work-related stress, frustrating in relation to situations on the road could escalate. Decreasing stress can take place in the form of employee assistance programmes. It is also important for organisations to identify those individuals who are more prone to driving anger and, based on this information, provide specific (yet equal) support to professional drivers. Employee assistance programmes could include redefining professional drivers' work role, assessing them for work overload or work underload, social support (e.g. counselling by industrial psychologists), etc.

Another organisational intervention based on personality could include screening potential employees during the recruitment process. Organisations employing professional drivers could consider psychometric assessments, situational-based assessments or competency-based interviews with the focus on angry driving. Psychometric assessments could include a personality assessment in which the industrial psychologist can assess for high scorers on neuroticism/low

scorers on emotional stability. If candidates score on these traits accordingly, the industrial psychologists could include further assessments, such as a simulation assessment (Correa, 2016). Using this technique one would be able to put the potential candidate in a driving situation and assess the manner in which they deal with frustration. One also could ask competency-based questions during the interview, in which the driver would have to describe a situation in which he/she got angry, what the situation was, what his/her response was and what he/she learnt from this situation.

Professional drivers are unique and therefore respond to driving situations in a unique manner. Organisations should be aware of these personal tendencies and intervene accordingly. It is also important to screen for 'problem drivers' during the recruitment process, as a preventative measure in the professional driving environment. This next section will discuss emotional intelligence and fostering a safe culture.

b) Fostering a safe culture by increasing emotional intelligence

This study includes the concept of emotional intelligence and its relationship with driving anger. Emotional intelligence is said to comprise (partially) the ability to regulate one's own emotions and perceive the emotions of others; this is important to experience a more positive environment (Kaufmann & Wagner, 2016). Because there are task-related emotions (Kaufmann & Wagner, 2016), professional drivers would need emotional intelligence in the workplace and this should extend to the road. For example, in a frustrating situation, a professional driver (and non-professional driver) should be able to regulate their own emotions behind the wheel.

The hypothesised negative relationship between emotional intelligence and driving anger was found to be *not significant* (PLS path coefficient = -0.067). This indicates that there was a weak relationship between emotional intelligence and driving anger, although the result did indicate that there is a potential negative relationship between the two variables. A possible reason for the result could be because the measure is a self-report measure in which increased social desirability has the potential to be present. The measure of emotional intelligence also fails to indicate the score of social desirability. This acts as a limitation in the study and will be discussed further in the next section. The other reason could be that not all of the items in the measure had a significant relationship with emotional intelligence (construct measured).

Because the relationship between emotional intelligence and driving anger is a novel one, it is still considered as a possible factor for interventions for professional drivers; emotional intelligence has been emphasised as an important concept within the workplace (Kaufmann & Wagner, 2016). Possible interventions could include screening for acceptable levels of emotional intelligence in employees. High emotional intelligence is said to increase cooperation (Rezvani et al., 2016); this is not only relevant for traffic rules, but for regulations set by organisations to instil a safe culture. Training programmes could create awareness of emotional intelligence and the need to regulate one's emotions, especially behind the wheel. Training programmes could also include techniques to regulate one's own emotions and to act accordingly (Rezvani et al., 2016).

Emotional intelligence has not been investigated much in its relationship with driving anger. The importance of emotional intelligence is emphasised when there is awareness. Management should understand the impact that emotional intelligence could have on general anger in the workplace, as well as anger on the road. The next section discusses driving anger as a whole and the responsibility organisations have to implement interventions to decrease driving anger.

c) Fostering a safe culture by decreasing driving anger

Studies show that the traffic environment acts as a social setting that is guided by rules and norms to govern appropriate driving behaviours. Violations of these rules and norms affect the safety of the traffic environment, and could result in significant emotions of anger (Wickens et al., 2016). As mentioned, professional driving is one of the most demanding occupations (Lannoo & Verhofstadt, 2016); long periods of driving potentially have an effect on performance ratings and income. There therefore is more motivation to 'perform' on the roads; for example getting from point A to point B as quickly as possible, transporting cargo safely but timeously, etc. It therefore is the responsibility of management and organisations to adopt a safe culture that emphasises safe driving behaviours and decreases anger behind the wheel.

In order for organisations to create a safe traffic culture amongst professional drivers, policies and procedures should be in place to identify acceptable and unacceptable driving behaviours (Amponsah-Tawaih & Mensah, 2016). Policies could include aspects such as time on the roads, and that professional drivers may only drive a specific length of time during the day; this could decrease workload, stress and fatigue aspects said to affect anger and aggression on the roads. The policies can also include driver monitoring, like a tracking system that monitors driving

behaviours. Based on these results, rewards and benefits could be offered to drivers. In the same way, unacceptable driving behaviours should form part of disciplinary procedures. For employees to follow these policies it is important for management to lead by example and to act on the roads as they would expect their drivers to act.

Possible initiatives to decrease stress could be to address burnout and fatigue. Organisations could prepare timetables that monitor the amount of time the driver has been on the road. Based on the job demands, managers should structure work tasks in such a way that drivers do not become frustrated and angry on the road (Amponsah-Tawaih & Mensah, 2016). Because the findings suggest that those low on emotional stability are likely to experience driving anger, organisations should be aware that high-anger drivers are most likely to be sensitive and to experience anxiety. High job demands could increase these emotions, possibly causing driving anger. Furthermore, organisations could adopt performance rating techniques that include the rating of safe driving, accident rates, traffic incidents, etc. (Amponsah-Tawaih & Mensah, 2016).

It is important that professional drivers receive further support in the form of education and training. Educational programmes aimed at training these drivers could possibly contribute to defensive driving strategies, as well as general traffic safety. Educational interventions could include stress management, driving techniques, anger management, etc. As mentioned, companies that employ individuals for the purpose of driving have the responsibility to ensure that these employees abide by traffic regulations (Zivkovic et al., 2015).

Management should continuously monitor compliance with policies and procedures and address any behaviours that are not in line with the safety culture of the organisations. It is also important that managers create a culture that embraces positive attitudes – a culture in which drivers feel that their leader has an open-door policy to discuss any issues that could frustrate them, as these frustrations extend to the roads.

In this study, only 31% of variance in driving anger was explained by personality and emotional intelligence. Organisations should realise that driving is a complex task, influenced by internal and external factors. Therefore it is important to create awareness in the work environment of driving anger and the risks involved. The safety of professional drivers lies in the hands of the organisations and management. The next section will discuss individual-level interventions.

Professional and non-professional drivers could use the following techniques to decrease driving anger.

5.2.2.2 Individual-level interventions

Many drivers personally know or have come across extremely angry drivers; radical examples include physical or vehicular assault. For every one of these individuals, there are thousands of other drivers, worldwide, who experience the same phenomenon. The individuals experiencing these angry emotions pose a significant danger and risk to themselves and to those on the road with them (Deffenbacher, 2016). Because there are no mental health diagnoses for very angry drivers, interventions should be focused on self-awareness and self-taught strategies. Driving anger can be said to comprise of cognitive (perceptions and thoughts of revenge), emotional (frustrated and mad), physiological (increased heart rate) and behavioural (yelling and honking the horn) responses to specific traffic situations (Deffenbacher, 2016).

Therefore, it is important to consider interventions at an individual level, whether it be for professional or non-professional drivers. Reducing anger on the roads can positively influence driving experience and decrease the risk for other road users. Individual interventions can be grouped into a) cognitive, b) relaxation, and c) behavioural interventions (Deffenbacher, 2016). These are discussed below.

a) Decreasing driving anger through cognitive interventions

Drivers are confronted on a daily basis with frustrating situations; research suggests that if drivers thinks about these situations in a certain way, their emotions can escalate even more (Deffenbacher, 2016). Examples of this are thoughts of revenge, negatively labelling (calling others names), judgmental thinking (female drivers cannot drive), and thinking about physical aggressiveness (wanting to harm other drivers). Furthermore, it is said that high-anger drivers engage in less positive, coping thinking. Consequently, cognitive interventions should aim to alter these anger-enhancing ideas. The premise is that the individual learns to process frustrating situations with less aggression and anger, and to take a positive stance to coping.

The first step in cognitive interventions is to create awareness. High-anger drivers should become aware of how their perceptions and thinking can influence their emotions and behaviours behind the wheel (Deffenbacher, 2016). As an intervention to enhance self-awareness, individuals can review past situations in which they were angry; this will allow them to visualise the angering

situation as well as self-monitoring activities. Re-living the situation could illustrate how negative thought patterns influence frustrating situations. Once drivers realise the connection between negative emotions and feelings of anger, it could allow them to adjust their thinking patterns to minimise anger behind the wheel. The same could be said for aggressive/revengeful thoughts; when drivers are aware of revengeful thoughts, they can work on ways to limit these thoughts. Cognitive interventions therefore should begin with self-awareness (Deffenbacher, 2016).

b) Decreasing driving anger with relaxation interventions

Interventions based on relaxation techniques target emotional-physiological arousal from the premise that, when angry drivers adopt relaxation skills, they lower their physiological arousal by initiating the necessary behavioural skills (Deffenbacher, 2016); these types of interventions are said to be the most effective (Sullman et al., 2015). Repetition of these skills strengthens efficacy in reducing angry behaviours. Again, awareness is of importance; if individuals are aware of situations that increase angry emotions and physiological responses (mostly internal cues), they could use these types of interventions. Relaxation interventions could include cue-controlled relaxation (slowly repeating a word/phrase that has been paired with relaxation, e.g. “calm down” or “keep calm”), deep-breathing relaxation (breathing in a certain manner or pattern when tense), personal relaxation imagery (imagining a situation where one is relaxed), etc. (Deffenbacher, 2016; Wickens et al., 2016).

Repetition of these interventions will increase the effectiveness of relaxation skills. One way of practising these interventions is imagining the frustrating situation and implementing a preferred intervention. The driver determines the most suitable relaxation technique for most situations. The more it is practised, the better these interventions will be employed in anger situations when behind the wheel (Deffenbacher, 2016; Wickens et al., 2016).

c) Decreasing driving anger with behavioural interventions

Drivers generally express their anger in an aggressive manner when confronted with a frustrating, provocative event on the road (Deffenbacher, 2016). Research suggests that high-anger drivers more often than not express their anger in acts of honking, swearing, flashing of lights and tailgating other drivers. Thus, high-anger drivers manage their anger in less adaptive and constructive manners when compared to low-anger drivers. Behavioural interventions could target these expressions and outbursts. The rationale behind behavioural interventions is based on the

notion that, when drivers express anger in a more constructive way (leading to a decrease in aggression), they will adopt safer driving styles for themselves and those around them. (Deffenbacher, 2016; Wickens et al., 2016).

Behavioural interventions could include calming techniques; this is where the driver shifts his/her attention from the root of the frustration to activities such as listening to music or singing a song (Deffenbacher, 2016). Another intervention could be distraction techniques. Individuals focus their attention on benign activities (like a personal 'to-do list' or an upcoming social event), rather than on the provoking situation. Problem solving as an intervention allows the driver to view the frustrating situation as a potential problem to be solved. This allows drivers to apply the best alternative to a personal drawback; examples include allowing sufficient time to travel from one point to the next, informing third parties if they are running late, carpooling if parking is a problem, etc. A final example of behavioural interventions is avoiding the source of anger, in which the driver identifies common anger triggers. If traffic frustrates a driver, attempt to take detours to miss congested areas, or leave enough time to miss the traffic (Deffenbacher, 2016).

It is also possible to combine interventions. Cognitive-behavioural interventions look at the awareness, development and rehearsal of strategies to combat these intense emotions; for example combining thoughts of revenge and avoidance techniques (Deffenbacher, 2016). Mindfulness is the final type of combined intervention. Mindfulness often starts by creating awareness within the situation, and then employing breathing techniques. The driver then assesses the situation in a calm, relaxed manner; emotions, feeling and behaviours are observed and accepted. The driver would then reflect on these feelings, adapt and reorganise them to decrease any negative aspects within these thoughts or behaviours. Mindfulness is heavily focused on the combination of relaxation and cognitive interventions (Deffenbacher, 2016).

Again, for these interventions to be effective at an individual level, angry drivers should be aware of their behaviours. Angry drivers, be they professional or non-professional drivers, should want to change their behaviours; the need/want to adopt safe driving behaviours should be present in order for interventions to be effective. Now that managerial implications have been discussed, the next section presents possible limitations of the study and recommendations for future research.

5.3 LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

Even though the current study has added value to the study of traffic psychology, there were indeed several limitations. It is important to note that these limitations do not significantly undermine the results presented in Chapter 4. However, these limitations do provide guidelines for aspects regarding future research and possible areas for improvement.

Firstly, although the sample of 199 drivers (professional and non-professional) was satisfactory, a greater sample size would have provided more credible results. It can be assumed that, due to the length of the questionnaire, respondents did not have the time to complete the survey. The restricted size of the sample could potentially cause concern when referring to the generalisability and validity of the inferences made regarding road users as a population. The sample size and structural model limited the testing of the structure model to the use of LISREL. In addition, a possible reason for the lack of practically significant relationships between most of the constructs could be twofold: 1) due to the small sample size and 2) due to the measures used (specifically personality, in which the items for extraversion had no significant relationship with the construct). It therefore is recommended that future studies attempt to gain a larger sample size of drivers.

Secondly, this study only approached drivers in the Cape Town area – the results therefore could not be generalised to the larger population of South Africa. Future research should aim to extend the study nationally in order for a South African representative sample to be obtained. Furthermore, one of the biggest limitations was that only 50 professional drivers completed the survey. The results obtained from these 50 drivers were all insignificant (because of the sample size). Hence, the current study's interventions were drawn up on the basis of the combined results of professional and non-professional drivers. Managerial implications would be more credible if a larger sample of professional drivers were obtained.

Thirdly, the current study relied on self-reported measures. Method bias or impression management could have been present. That being said, the measures used do not indicate the level of impression management, therefore one can only assume that social desirability was high. Participants most likely responded in a way that put them in a favourable light. Consequently, the exclusive use of self-reported questionnaires could artificially inflate correlations between variables (Langenhoven, 2015). It is suggested that future research should consider objective

measures, especially for emotional intelligence. The web-based nature of the questionnaire also presented as a limitation. Most respondents were those who had access to email. Only a handful of professional drivers completed the questionnaire using the paper-pencil method. This again affects generalisability. Furthermore, even though confidentiality was assured, it is likely that the respondents did not trust confidentiality and as a result could have answered dishonestly.

Fourthly, because only 31% of variance in driving anger was explained by the variables in this study, future research should aim to include other variables in order to determine additional factors influencing driving anger. Hence, the present model could be expanded in future research. Furthermore, some of the measures included in the study contained reverse-scored items. These items are said to influence scale reliability and present low inter-item correlations (Langehoven, 2015). Future studies could rewrite these items in such a way that they assume positive connotations.

Lastly, the questionnaire was only provided in English. Some respondents had Afrikaans, Xhosa and Zulu as first language, which could have made items difficult to understand. Some of the items could have been interpreted incorrectly and could have influenced the results of the study. Even though the scales proved to be reliable, further development of these measures should take place in a South African context. Because studies in the context of professional drivers are limited, it is of the utmost importance that future research focuses on professional drivers.

A possible problem with driving anger is that the term has many definitions, and therefore the instruments that measure these behaviours utilise different factors to reach the needed conclusions. The lack of standardisation between definitions and instruments poses a problem in that it decreases the ability for results to be compared against other studies. Future research should clearly identify and determine the best way in which driving behaviour can be assessed. (Dahlen et al., 2012).

5.4 CHAPTER SUMMARY

By exploring driving anger and possible variables affecting driving anger, this research has made an important contribution to the study of traffic psychology and safety. The study has contributed to the understanding of driving anger and the impact it could have on professional and non-professional drivers. Based on the results reported in Chapter 4, possible interventions for

industrial psychologists and managers were suggested in order for a safe driving culture to be developed. Furthermore, the limitations of this study and recommendations for future research were discussed.

REFERENCES

- Abrahams, Z. (2014). Illegitimate tasks, personal resources and job resources as antecedents of job crafting. Unpublished Master's thesis, Stellenbosch University, Stellenbosch, South Africa
- Amponsah-Tawaih, K., & Mensah, J. (2016). The impact of safety climate on safety related driving behaviors. *Transportation Research Part F*, 40, 48-55.
- Arnau-Sabates, L., Sala-Roca, J., & Jariot-Garcia, M. (2012). Emotional abilities as predictors of risky driving behaviour among cohort of middle aged drivers. *Accident Analysis and Prevention*, 45, 818-825.
- Ashton, M. C., & Lee, K. (2007). Empirical, theoretical, and practical advantages of the HEXACO Model of Personality Structure. *Personality and Social Psychology Review*, 11, 150-166.
- Babbie, E., & Mouton, J. (2001). *The practice of social research*. Cape Town: Oxford University Press Southern Africa.
- Bailey, S., Lennon, A., & Watson, B. (2016). Getting mad may not mean getting even: The influence of drivers' ethical ideologies on driving anger and related behaviour. *Transportation Research Part F: Traffic Psychology and Behaviour*, 36, 104-116.
- Barford, K. A., & Smillie, L. D. (2016). Openness and other Big Five traits in relation to dispositional mixed emotions. *Personality and Individual Differences*, 102, 118-122.
- Bax, C., Leroy, P., & Hagenzieker, M. P. (2014). Road safety knowledge and policy: A historical institutional analysis of the Netherlands. *Transportation Research Part F: Traffic Psychology and Behaviour*, 25, 127-136.
- Begg, D. J., & Langley, J. D. (2001). Changes in risky driving behaviour from age 21 to 26 years. *Journal of Safety Research*, 32, 491-499.
- Begg, D. J., & Langley, J. D. (2004). Identifying predictors of persistent non-alcohol or drug-related risky driving behaviours among a cohort of young adults. *Accident Analysis and Prevention*, 36, 1067-1071.

- Bjorklund, G. M. (2008). Driver irritation and aggressive behavior. *Accident Analysis and Prevention, 40*, 1069-1077.
- Blankenship, K. L., & Nesbit, S. M. (2013). Driving stimuli increases accessibility of aggression-related concepts in “angry” drivers. *Personality and Individual Differences, 55*, 135-140.
- Bogdan, S. R., Mairean, C., & Havarneanu, C. (2016). A meta-analysis of the association between anger and aggressive driving. *Transportation Research Part F*, article in press.
- Bone, S. A., & Mowen, J. C. (2006). Identifying the traits of aggressive and distracted drivers: A hierarchical trait model approach. *Journal of Consumer Behaviour, 5*, 454-464.
- Brink, E. R. (2014). The relationships between the HEXACO personality dimensions and organizational citizenship behaviours within the civil engineering sector. Unpublished master's thesis, Stellenbosch University, Stellenbosch, South Africa.
- Bucchi, A., Sangiori, C., & Vignali, V. (2012). Traffic psychology and driver behavior. *Procedia-Social and Behavioral Sciences, 53*, 973-980.
- Cellar, D. F., Nelson, Z. C., & Yorke, C. M. (2000). The five-factor model and driving behavior: Personality and involvement in vehicular accidents. *Psychological Reports, 86*, 454-456.
- Chen, G. X., Fang, Y., Guo, Y. F., & Hanowski, R. J. (2016). The influence of daily sleep patterns of commercial truck drivers on driving performance. *Accident Analysis and Prevention, 91*, 55-63.
- Chin, W. (1998). The partial least squares approach to structural equation modelling. In G. A. Marcoulides (ed.), *Modern methods of business research* (pp. 295-358). Mahwah, NJ: Lawrence Erlbaum Associates.
- Chliaoutakis, J. E., Damakos, P., Tzamalouka, G., Bakou, V., Koumaki, M., & Darviri, C. (2002). Aggressive behaviour while driving as a predictor of self-reported car crashes. *Journal of Safety Research, 33*, 431-443.
- Chopra, K. P., & Kanji, G. K. (2010). Emotional intelligence: A catalyst for inspiration, leadership and management excellence. *Total Quality Management, 21*(10), 971-1004.

- Constantinou, E., Panayiotou, G., Konstantinou, N., Loutsiou-Ladd, A., & Kapardis, A. (2011). Risky and aggressive driving in young adults: Personality matters. *Accident Analysis and Prevention, 43*, 1323-1331.
- Correa, J. C. (2016). The behavioural interaction of road users in traffic: An example of the potential of intelligent agent-based simulations in psychology. *Revista Latinoamericana de Psicologia, 48*, 201-208.
- Dahlen, E. R., & White, R. P. (2006). The Big Five factors, sensation seeking, and driving anger in the prediction of unsafe driving. *Personality and Individual Differences, 41*, 903-915.
- Dahlen, E. R., Edwards, B. D., Tubré, T., Zyphur, M. J., & Warren, C. R. (2012). Taking a look behind the wheel: An investigation into personality predictors of aggressive driving. *Accident Analysis and Prevention, 45*, 1-9.
- Dahlen, E. R., Martin, R. C., Ragan, K., & Kuhlman, M. M. (2005). Driving anger, sensation seeking, impulsiveness, and boredom proneness in the prediction of unsafe driving. *Accident Analysis and Prevention, 37*, 341-348.
- Davies, G. R., & Roberts, I. (2014). Is road safety being driven in the wrong direction? *International Journal of Epidemiology, 43*(5), 1615-1623.
- Davies, K. A., Lane, A. M., Devonport, T. J., & Scott, J. A. (2010). Validity and Reliability of a Brief Emotional Intelligence Scale. *Journal of Individual Differences, 31*(4), 198-208.
- Deffenbacher, J. L. (2016). A review of interventions for the reduction of driving anger. *Transportation Research Part F: Traffic Psychology and Behaviour*, in press.
- Deffenbacher, J. L., Deffenbacher, D. M., Lynch, R. S., & Richards, T. L. (2003). Anger, aggression, and risky behavior: a comparison of high and low anger drivers. *Behaviour Research Therapy, 41*(6), 701-718.
- Deffenbacher, J. L., Lynch, R. S., Oetting, E. R., & Swaim, R. C. (2002). The Driving Anger Expression Inventory: A measure of how people express their anger on the road. *Behaviour Research and Therapy, 40*, 717-737.

- Deffenbacher, J. L., Oetting, E. R., & Lynch, R. S. (1994). Development of a driving anger scale. *Psychological Reports, 74*, 83-91.
- Degraeve, B., Granie, M., Pravossoudovitch, K., & Monaco, G. L. (2015). Social representation associated with men and women drivers among French adolescents and adults. Effects of the perceiver's age, sex, and socioeconomic status. *Transportation Research Part F, 34*, 1-17.
- DeJoy, D. M. (1992). An examination of gender differences in traffic accident risk perception. *Accident Analysis and Prevention, 24*(3), 237-246.
- Delhomme, P., Chaurand, N., & Paran, F. (2012). Personality predictors of speeding in young drivers: Anger vs. sensation seeking. *Transportation Research, 15*, 654-666.
- De Villiers, C. (2015). The relationships between emotional labour, the HEXACO personality traits, work engagement and burnout in the hospitality industry. Unpublished Master's thesis, Stellenbosch University, Stellenbosch, South Africa
- Du Plessis, A. G. (2014). The relationship between emotional intelligence, locus of control, self-efficacy, sense of coherence and work adjustment. Unpublished master's thesis, Stellenbosch University, Stellenbosch, South Africa.
- Edwards, B. D., Warren, C. R., Tubré, T. C., Zyphur, M. J., & Hoffner-Prillaman, H. (2013). The validity of narcissism and driving anger in predicting aggressive driving in a sample of young drivers. *Human Performance, 26*(3), 191-210.
- Elvik, R. (2016). Does the influence of risk factors on accident occurrence change over time? *Accident Analysis and Prevention, 91*, 91-102.
- Fernandes, R., Hatfield, J., & Job, R. F. S. (2010). A systematic investigation of the differential predictors for speeding, drinking-driving, driving while fatigued, and not wearing a seat belt. *Transportation Research Part F, 13*, 179-196.
- Fouche, E. (2015). *The relationships between engagement, burnout and performance in an e-commerce retail company*. Unpublished Master's thesis, Stellenbosch University, Stellenbosch, South Africa

- Ge, Y., Qu, W., Jiang, C., Du, F., Sun, X., & Zhang, K. (2014). The effect of stress and personality on dangerous driving behaviours among Chinese drivers. *Accident Analysis and Prevention, 73*, 34-40.
- Ge, Y., Zhang, Q., Zhang, J., Zhao, W., Yu, T., Zhang, K., & Qu, W. (2016). Validation of the Driver's Angry Thoughts Questionnaire (DATQ) in a Chinese sample. *Accident Analysis and Prevention, 95*, 362-372.
- Gidron, Y., Gaygisiz, E., & Lajunen, T. (2014). Hostility, driving anger, and dangerous driving: The emerging role of hemispheric preference. *Accident Analysis and Prevention, 73*, 236-241.
- Giroto, E., De Andrade, S. M., & Gonzalez, A. D. (2016). Professional experience and traffic accidents/near-miss accidents among truck drivers. *Accident Analysis and Prevention, 95*, 299-304.
- González-Iglesias, B., Gómez-Fraguela, J. A., & Luengo-Martín, M. A. (2012). Driving anger and traffic violations: Gender differences. *Transportation Research Part F, 15*, 404-412.
- Gow, A. J., Whiteman, M. C., Pattie, A., & Deary I. J. (2005). Goldberg's 'IPIP' Big-Five factor markers: Internal consistency and concurrent validation in Scotland. *Personality and Individual Differences, 39*(2), 317-329.
- Guo, M., Wei, W., Liao, G., & Chu, F. (2016). The impact of personality on driving safety among Chinese high-speed railway drivers. *Accident Analysis and Prevention, 92*, 9-14.
- Hagenzieker, M. (2014). Introduction to the special issue on "the history of road safety research and the role of traffic psychology". *Transportation Research Part F: Traffic Psychology and Behaviour, 25*, 110-111.
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2012). Partial least squares: The better approach to structural equation modeling. *Long Range Planning, 45*(5-6), 312-319.
- Hakkert, A. S. & Gitelman, V. (2014). Thinking about the history of road safety research: Past achievements and future challenges. *Transportation Research Part F: Traffic Psychology and Behaviour, 25*, 137-149.

- Hennessy, D. (2011). *Social, personality, and affective constructs in driving*. London: Elsevier.
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modelling in international marketing. *Advances in International Marketing*, 20, 277-319.
- Herrero-Fernandez, D. (2011). Psychometric adaption of the Driving Anger Expression Inventory in a Spanish sample: Differences by age and gender. *Transportation Research Part F: Traffic Psychology and Behaviour*, 14(4), 324-329.
- Herrero-Fernandez, D. (2016). Psychological, subjective and behavioural differences between high and low anger drivers in a simulation task. *Transportation Research Part F*, in press.
- Hill, T., Stephens, A. N., & Sullman, M. J. M. (2016). Driving anger in Ukraine: Appraisals, not trait driving anger, predict anger intensity while driving. *Accident Analysis and Prevention*, 88, 20-28.
- Hoe, J., & Hoare, Z. (2012). Understanding quantitative research: Part 1. *Nursing Standard*, 27(15-17), 52-57.
- Horrey, W. J., Lesch, M. F., Mitsopoulos-Rubens, E., & Lee, J. D. (2015). Calibration of skills and judgment in driving: Development of a conceptual framework and the implications for road safety. *Accident Analysis and Prevention*, 76, 25-33.
- Howell, D. C. (2012). Treatment of missing data: Part 1 [Online]. Retrieved from http://www.uvm.edu/~dhowell/StatPages/More_Stuff/Missing_Data/Missing.html
- Hunter, W. F. J. R. (2014). The role of integrity and personality in counterproductive work behaviour. Unpublished master's thesis, Stellenbosch University, Stellenbosch, South Africa.
- Hu, T., Xie, X., & Li, J. (2013). Negative or positive? The effect of emotion and mood on risky driving. *Transportation Research Part F*, 16, 29-40.
- Iversen, H., & Rundmo, T. (2002). Personality, risky driving and accident involvement among Norwegian drivers. *Personality and Individual Differences*, 33, 1251-1263.
- Jakobwitz, S., & Egan, V. (2006). The dark triad and normal personality traits. *Personality and Individual Differences*, 40(2), 331-339.

- Jimenez-Mejias, E., Prieto, C. A., Martinez-Ruiz, V., De Dios, J., Del Castillo, L., Lardelli-Claret, P., & Jimenez-Moleon, J. J. (2014). Gender-related differences in distances travelled, driving behaviour and traffic accidents among university students. *Transportation Research Part F: Traffic Psychology and Behaviour*, 27, 81-89.
- Johnson, B. (2001). Toward a new classification of nonexperimental quantitative research. *Educational Researcher*, 30(2), 3-13.
- Jonah, B. A. (1997). Sensation seeking and risky driving: A review and synthesis of the literature. *Accident Analysis and Prevention*, 29(5), 651-665
- Jonason, P. K., Zeigler-Hill, V., & Okan, C. (2017). Good v. evil: Predicting sinning with dark personality traits and moral foundations. *Personality and Individual Differences*, 104, 180-185.
- Jonker, C. S., & Vosloo, C. (2008). The psychometric properties of the Schutte Emotional Intelligence Scale. *South African Journal of Industrial Psychology*, 34(2), 21-30.
- Jöreskog, K. G., & Sörbom, D. (1996). *User's reference guide*. Chicago: Scientific Software International.
- Jovanovića, D., Lipovac, K., Stanojević, P., & Stanojević, D. (2011). The effects of personality traits on driving-related anger and aggressive behaviour in traffic among Serbian drivers. *Transportation Research Part F: Traffic Psychology and Behaviour*, 14(1), 43-53.
- Kaufmann, L., & Wagner, C. M. (2016). Affective diversity and emotional intelligence in cross-functional sourcing teams. *Journal of Purchasing and Supply Management*, in press.
- Kun, B., Urban, R., Paksi, B., & Csobor, L. V. (2011). Psychometric characteristics of the Emotional Quotient Inventory, Youth Version, Short Form, in Hungarian high school students. *American Psychological Association*, 24(2), 518-523.
- Kwantes P. J., Derbentseva, N., Lam, Q., Vartanian, O., & Marmurek, H. H. C. (2016). Assessing the big five personality traits with the latent semantic analysis. *Personality and Individual Differences*, 102, 229-233.

- Lambert-Bélanger, A., Dubois, S., Weaver, B., Mullen, N., & Bédard, M. (2012). Aggressive driving behaviour in young drivers (aged 16 through 25) involved in fatal crashes. *Journal of Safety Research*, 43(5-6), 333-338.
- Langenhoven, A. (2015). How job demands and resources predict burnout, engagement and intention to quit in call centres. Unpublished Master's thesis, Stellenbosch University, Stellenbosch, South Africa.
- Lannoo, S., & Verhofstadt, E. (2016). What drives the drivers? Predicting turnover intentions in the Belgian bus coach industry. *Transportation Research Part A*, 91, 251-259.
- Li, F., Yao, X., Jiang, L. & Li, Y. (2014). Driving anger in China: Psychometric properties of the Driving Anger Scale (DAS) and its relationship with aggressive driving. *Personality and Individual Differences*, 68, 130-135.
- Mallia, L., Lazuras, L., Violani, C., & Lucidi, F. (2015). Crash risk and aberrant driving behaviours among bus drivers: The role of personality and attitudes towards traffic safety. *Accident Analysis and Prevention*, 79, 145-151.
- Miles, D. E., & Johnson, G. L. (2003). Aggressive driving behaviours: are there psychological and attitudinal predictors. *Transportation Research Part F*, 6, 147-161.
- Nell, E. (2012). A test of the job demands-resources model for nurses. Unpublished Master's research proposal, Stellenbosch University, Stellenbosch, South Africa.
- Nell, E. (2015). Testing the job demands-resources model on nurses. Unpublished Master's thesis, Stellenbosch University, Stellenbosch, South Africa.
- Nesbit, S. M., & Conger, J. C. (2012). Predicting aggressive driving behaviours from anger and negative cognitions. *Transportation Research Part F*, 15, 710-718.
- Öz, B., Özkan, T., & Lajunen, T. (2010). Professional and non-professional drivers' stress reactions and risky driving. *Transportation Research Part F*, 13, 32-40.
- Öz, B., Özkan, T., & Lajunen, T. (2014). Trip-focused organizational safety climate: Investigating the relationships with errors, violations and positive driver behaviours in professional driving. *Transportation Research Part F Traffic Psychology and Behaviour*, 26, 361-369.

- Özkan, T., & Lajunen, T. (2005). Why are there sex differences in risky driving? The relationship between sex and gender-role on aggressive driving, traffic offences, and accident involvement among young Turkish drivers. *Aggressive Behavior*, 31(6), 547-558.
- Özkan, T., & Lajunen, T. (2011). *Person and environment: Traffic culture*. London: Elsevier.
- Özkan, T., Lajunen, T., & Summala, H. (2006). Driver Behaviour Questionnaire: A follow-up study. *Accident Analysis and Prevention*, 38(2), 386-395.
- Parr, M. N., Ross, L. A., McManus, B., Bishop, H. J., Wittig, S. M. O., & Stavrinou, D. (2016). Differential impact of personality traits on distracted driving behaviours in teens and older adults. *Accident Analysis and Prevention*, 92, 107-112.
- Pease, C. R., & Lewis, G. J. (2015). Personality links to anger: Evidence for trait interaction and differentiation across expression style. *Personality and Individual Differences*, 74, 159-164.
- Pennstate. (2015). *Detecting multi-collinearity using variance inflation factors*. Pennstate Eberly College of Science. Retrieved from <https://onlinecourses.science.psu.edu/stat501/node/347>
- Polders, E., Cornu, J., De Ceunynck, T., Daniels, S., Brijs, K., Brijs, T., Hermans, E., & Wets, G. (2015). Drivers' behavioural responses to combined speed and red light cameras. *Accident Analysis and Prevention*, 81, 153-166.
- Possible Questionnaire Format for Administering the 50-Item Set of IPIP Big-Five Factor Markers*. Retrieved August, 29, 2013 from http://ipip.ori.org/New_IPIP-50-item-scale.htm
- Purucker, C., Naujoks, F., Prill, A., & Neukum, A. (2017). Evaluating distraction of in-vehicle information systems while driving by predicting total eyes-off-road times with keystroke level modeling. *Applied Ergonomics*, 28, 543-554.
- Rezvani, A., Chang, A., Wiewiora, A., Ashkanasy, N. M., Jordan, P. J., & Zolin, R. (2016). Manager emotional intelligence and project success: The mediating role of job satisfaction and trust. *International Journal of Project Management*, 34(7), 1112-1122.

- Road Traffic Report. Retrieved May, 04, 2015 from <https://www.arrivealive.co.za/documents/March%202011%20Road%20Traffic%20Report.pdf>
- Robbins, J. (2012). Partial-least squares. *Long Range Planning*, 45(5-6), 309-311.
- Roidl, E., Frehse, B., & Hoger, R. (2014). Emotional states of drivers and the impact on speed, acceleration and traffic violations – A simulator study. *Accident Analysis and Prevention*, 70, 282-292.
- Roidl, E., Siebert, F. W., Oehl, M., & Hoger, R. (2013). Introducing a multivariate model for predicting driving performance: The role of driving anger and personal characteristics. *Journal of Safety Research*, 47, 47-56.
- Rothengatter, T. (1997). Psychological aspects of road user behaviour. *Applied Psychology: An International Review*, 46(3), 223-234.
- Rowe, R., Roman, G. D., McKenna, F. P., Barker, E., & Poulter, D. (2015). Measuring errors and violations on the road: A bi-factor modeling approach to the Driver Behavior Questionnaire. *Accident and Analysis and Prevention*, 74, 118-125.
- Sadri, G. (2012). Emotional intelligence and leadership development. *Public Personal Management*, 41(3), 535-548
- Sarbescu, P., Costea, I., & Rusu, S. (2012). Using the alternative Five Factor Personality Model to explain driving anger expression. *Social and Behavioral Sciences*, 273-277.
- Schutte, N. S., Malouff, J. M., Hall, L. E., Haggerty, D. J., Cooper, J.T., Golden, C. J., & Dornheim, L. (1998). Development and validation of a measure of emotional intelligence. *Personality and Individual Differences*, 25, 167-177.
- Scott-Parker, B., Hyde, M. K., Watson, B., & King, M. J. (2013). Speeding by young novice drivers: What can personal characteristics and psychosocial theory add to our understanding? *Accident Analysis and Prevention*, 50, 242-250.
- Sharma, S., Deller, J., Biswal, R., & Mandal, M. (2009). Emotional Intelligence. *International Journal of Cross Cultural Management*, 9(2), 217-236.

- Somazer, G., Uzumcuoglu, Y., & Özkan, T. (2016). The role of traffic law enforcements in the relationship between cultural variables and traffic fatality rates across some countries of the world. *Transportation Research Part F*, 38, 137-150.
- Stephens, A. N., & Sullman, M. J. M. (2015). Trait predictors of aggression and crash-related behaviours across drivers from the United Kingdom and the Irish Republic. *Risk Analysis*, 35(9), 1730-1745.
- Stephens, A. N., Hill, T., & Sullman, M. J. M. (2016). Driving anger in Ukraine: Appraisals, not trait driving anger, predict anger intensity while driving. *Accident Analysis & Prevention*, 88, 20-28
- Stolzenberg, R. M (2016). *Multiple regression analysis. Handbook of data analysis* [e-book]. Retrieved from <http://dx.doi.org.ez.sun.ac.za/10.4135/9781848608184>.
- Sukhai, A. (2003). *An exploratory study of road rage, aggressive driving and other hazardous driving behaviour among a representative sample of motorists in Durban, South Africa*. (Technical Report). MRC-UNISA Crime, Violence and Injury Lead programme & University of Natal Interdisciplinary Accident Research Centre, Durban.
- Sullman, M. J. M., & Stephens, A. N. (2013). A comparison of the Driving Anger Scale and the Propensity for Angry Driving Scale. *Accident Analysis and Prevention*, 58, 88-96.
- Sullman, M. J. M., Stephens, A. N., & Yong, M. (2015). Anger, aggression and road rage behaviour in Malaysian drivers. *Transportation Research Part F*, 29, 70-82.
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics*. Upper Saddle River, NJ: Pearson.
- Theron, C. (2013). *Class notes: Industrial Psychology, Research Methodology*. Stellenbosch University, Stellenbosch, South Africa.
- Theron, C. (2014). *Class notes: Industrial Psychology, Research methodology*. Stellenbosch University, Stellenbosch, South Africa.

- Traubman-Ben-Ari, O. (2016). Parents' perceptions of the Family Climate for Road Safety: Associations with parents' self-efficacy and attitudes toward accompanied driving and teens' driving styles. *Transportation Research Part F, 40*, 14-22.
- Traubman-Ben-Ari, O., & Yehiel, D. (2012). Driving styles and their associations with personality and motivation. *Accident Analysis and Prevention, 45*, 416-422.
- Ulleberg, P., & Rundmo, T. (2003). Personality, attitudes and risk perception as predictors of risky driving behaviour among young drivers. *Safety Science, 41*, 427-443.
- Uzumcuoglu, Y., Özkan, T., Lajunen, T., Morandi, A., Orsi, C., Papadakaki, M., & Chliaoutakis, J. (2016). Life quality and rehabilitation after a road traffic crash: A literature review. *Transportation Research Part F, 40*, 1-13.
- Vardaki, A., & Yannis, G. (2013). Investigating the self-reported behaviours of drivers and their attitudes to traffic violations. *Journal of Safety Research, 46*, 1-11.
- Van der Zee, K., Thijs, M., & Schakel, L. (2002). The relationship of emotional intelligence with academic intelligence and the big five. *European Journal of Personality, 16*, 103-125.
- Van Der Nest, L. J. (2010). Exploring the moderating effect of emotional intelligence on the relationship between narcissism and workplace aggression. Unpublished master's thesis, Stellenbosch University, Stellenbosch, South Africa.
- Venter, K. (2010). *Intertwining road user behaviour and traffic psychology with ITS technology in South Africa. CSRI: Research Space*. Retrieved March 9, 2013: http://www.researchspace.csir.co.za/dspace/bitstream/10204/4435/1/Venter1_2010.pdf.
- Villieux, A., & Delhomme, P. (2010). Driving anger and its expression: Further evidence of validity and reliability of the Driving Anger Expression Inventory French adaption. *Journal of Safety Research, 41*(5), 417-422.
- Weinberger, L. A. (2009). Emotional intelligence, leadership style, and perceived leadership effectiveness. *Advances in Developing Human Resources, 11*(6), 747-772.

- Weller, J. A., & Thulin, E. W. (2012). Do honest people take fewer risks? Personality correlates of risk-taking to achieve gains and avoid losses in HEXACO space. *Personality and Individual Differences, 53*, 923-926.
- Wickens, C. M., Mann, R. E., Ianlomiteanu, A. R., & Stoduto, G. (2016). Do driver anger and aggression contribute to the odds of a crash? A population-level analysis. *Transportation Research Part F*, in press.
- Wickens, C. M., Mann, R. E., Stoduto, G., Butters, J. E., Ialomiteanu, A., & Smart, R. G. (2012). Does gender moderate the relationship between driver aggression and risk factors? *Accident Analysis and Prevention, 45*, 10-18.
- Wishart, D., Somoray, K., & Rowland, B. (2017). Role of thrill and adventure seeking in risky work-related driving behaviours. *Personality and Individual Differences, 104*, 362-367.
- Yagil, D. (2001). Interpersonal antecedents of drivers' aggression. *Transportation Research Part F, 4*, 119-131.
- Yukl, G. (2013). *Leadership in organizations*. England: Pearson.
- Zhang, T., & Chan, A. H. S. (2016). The association between driving anger and driving outcomes: A meta-analysis of evidence from the past twenty years. *Accident Analysis and Prevention, 90*, 50-62.
- Zhang, T., Chan, A. H. S., & Zhang, W. (2015). Dimensions of driving anger and their relationships with aberrant driving. *Accident Analysis and Prevention, 81*, 124-133.
- Zivkovic, S., Nikolic, V., & Markic, M. (2015). Influence of professional drivers' personality traits on road traffic safety: Case study. *International Journal of Injury Control and Safety Promotion, 22*(2), 100-110.