

REVIEW OF RESEARCH TO INFORM THE DEVELOPMENT OF A HAZARD PERCEPTION TEST FOR NOVICE DRIVERS IN SOUTH AFRICA

K Venter and M Sinclair*

CSIR Built Environment, PO Box 395, Pretoria, tel: 012 841 3856,
Email: kventer@csir.co.za.

*Department of Civil Engineering Stellenbosch University, tel: 021 808 3838, Email:
msinclair@sun.ac.za.

ABSTRACT

A driver constantly needs to be aware of his or her driving within a specific traffic environment. ‘Situational Awareness’ is the term used to describe the level of awareness drivers have to apply in the driving environment, specifically to hazards that may be present. The ability to respond appropriately to hazards is a direct consequence of this awareness. Research has shown that awareness skills are largely lacking in novice drivers primarily due to their inexperience: hazard perception skills are developed and improved over time. South African research shows that locally novice drivers are also overrepresented in crash statistics. However little evidence as to why is available. This review provides an overview and synthesis of available international and local research related to hazard perception and aims to provide baseline information that serves as an introduction to South African research focussing on novice driver hazard perception within the South African road environment.

1. INTRODUCTION

International research points to the fact that novice drivers lack the ability to perceive threats in their driving environments (Young and Regan, 2007; Borowsky et al., 2010). Preliminary indications are that South African novice drivers also have difficulty in identifying, anticipating, and reacting to hazards in their immediate driving environment (Venter, 2014). Despite the fact that South African novice drivers are over represented in crash statistics, little local research on the matter is available (Chokocho et al., 2012).

There have been intentions to develop a hazard perception test for South African learner drivers along with regulating driving hours and driving practices including novice drivers driving with passengers, restrictions on night time driving or driving on freeways (Chokocho et al., 2012). South African driving conditions is unique and special consideration should be given to living areas, cultural aspects as well as available infrastructure and conditions under which novice driving takes place.

2. AIM OF THIS PAPER

This paper provides a preliminary overview of applicable literature. The review considers available international and local research related to hazard perception and situational awareness, contributory factors that influence hazard perception in novice drivers as well as literature that relates hazard perception within the context of the road. The review makes special reference to specific types of traffic environments, roads, and different driving conditions and how hazard perception is influenced by these.

3. REVIEW

3.1. Thematic areas under review

The first thematic area entails a description of key psychological constructs that are associated with hazard perception in novice drivers. The second theme revolves around the perception of hazards within the road and traffic environment in order to inform the design of safer roads. Little of the available research has thus far considered how novice drivers apply psychological constructs such as situational awareness and hazard perception in practical road traffic and driving situations and *vice versa*, how specific road and traffic environments influence hazard perception in young drivers.

3.2. Novice drivers and hazard perception

3.2.1. Situational awareness, hazard perception and risk

Driving requires the adequate functioning of a range of human abilities including vision, perception, cognitive functioning, and physical abilities. Any loss of efficiency in any of these functions can reduce performance and increase risk on the road (Moutchou, et al., 2012). Drivers constantly need to be aware of driving within a specific traffic environment. Endsley (2000) defines this as “situational awareness” or - “knowing what is going on around you” and inherently “knowing what is important”.

Perception of risk in traffic is the ability to detect potentially dangerous traffic situations early enough to take adequate action (Sagberg, 2009; Scott-Parker, 2012). Sjöberg, Moen and Rundmo (2004) states that this risk is closely associated with uncertainty where the outcomes of a certain traffic situation are not known. According to the authors, risk mean different things to different people and is dependent on cultural and societal norms. Another interesting concept highlighted was that drivers for example take a “voluntary risk” to drive. But tend to perceive themselves as less at risk when in control of a situation such as driving as most drivers do not feel at risk due to believing in ones own superior driving skills.

3.2.2. Novice drivers and their perception of hazards

Previously, research has shown that hazard perception skills are notoriously lacking in young novice drivers (De Craen, 2007, Borowsky et al., 2010). Different cognitive, physical, and social, personality, and demographic factors seem to play a role in how young drivers perceive and experience risks while driving.

Hazard perception is a learned skill that improves with driving experience over time (Borowsky, Oron-Gilad, and Parmet, 2010). Young drivers first need to develop the ability to be aware of their immediate environment (situational awareness) in order to develop the needed skills to recognise and act safely when presented with risks in his driving environment (hazard perception). Factors that contribute to novice drivers' high risk include personality factors (Miles and Johnson, 2003), demographic factors, including gender and age (Scott-Parker, Watson, and King 2009) as well as social factors such as interactions with parents and peers (McKay et al. 2003; Vermaak, 2000; Sinclair, 2014).

Galovski and Blanchard (2004) provided an overview (profile) of the type of person who would typically be involved in road rage. In their view, variables, such as perceived social class (status), gender, ethnicity, perception of aggression and age, play a significant and overlooked role in the development, maintenance, and exacerbation of aggressive driving behaviours. Sukhai and Seedat (2013) confirms that younger South African drivers also tend to drive more aggressively specifically with regards to level 2 behaviour which is defined as aggressive road behaviour where the driver displays mild, verbal or gestural expressions of anger on the road, including insensitive or obscene gestures and inappropriate and/or excessive use of the horn and lights.

Other emotional constructs researched in relation to young drivers include recklessness (Styles et al., 2005; Palamara et al., 2012), and impulsivity (Harris and Houston, 2011). Aspects of emotions influencing driving include the inclination to perform risky behaviours such as drinking and driving (Scott-Parker, Watson, King and Hyde, 2014), distracted driving (Carter et al., 2014) and speeding behaviour (De Craen et al., 2007; Scott-Parker et al., 2013).

Previously Vermaak (2000) indicated that secondary school children in South Africa experiment with risky driving because of peer pressure, misjudgement of risk or alcohol and drug abuse and added that these young people are at a stage of acquiring learner licences where they will need to develop the correct skills, knowledge and attitude for driving. Recently, Sinclair (2014) reported on the knowledge, attitudes and perceptions of young people in two lower income communities in South Africa regarding drinking and driving, being a passenger in a vehicle with a drunk driver and so forth. The findings indicated that South African young people generally has a low perception of risk when consuming alcohol and participating in traffic either as a driver, passenger or a pedestrian. Contributing to this low perception of risk might be the notion that it is socially acceptable as the older generation set an example of drinking and driving and peer group influences encourages alcohol consumption and participation in traffic as a norm rather than the exception.

According to Knight (2012) social theories suggests that environmental, individual and developmental factors influences skill development in novice drivers. According to this research these factors play a key role in how driving skills and experience is acquired. This social and developmental framework forms the basis of for example staged and graduated licensing schemes.

3.2.3. Theories that potentially explain novice driver behaviour

The Theory of Planned Behaviour is probably one of the most popular theories used to explain novice driver behaviour and the effect that emotions have on these novice drivers (Redshaw, 2004). Young drivers experience intense emotions throughout their adolescent years and that in order to facilitate attitudinal and behaviour change, engaging individuals on an emotional level is a key component of the process. Redshaw (2004) concludes that “personalised” responses need to inform major behavioural theories as every driver is at any given time responding to a form of emotional engagement. Understanding this engagement might explain behaviour within specific traffic environment and contexts. This could assist with traffic regulation that is appropriate and responding to road users’ way of operating on the road.

The Social Learning Theory on the other hand, supports the fact that learning is either operant or instrumental where behaviour is shaped by the stimuli and consequences of the behaviour (. Social behaviour is shaped through direct conditioning or imitation of significant others e.g. parents, friends and authority figures ((Krohn et al. 1985; Fleiter et al. 2006)Scott-Parker et al., 2012). This behaviour is strengthened through rewards, or avoided because of punishment. People learn through social interaction with significant others in their lives. Acceptable social norms and values are defined by these significant groups (Venter, 2014).

The Systems Approach to road traffic incorporates a holistic view in which all factors are considered in an attempt to explain road traffic crashes (Sukhai & Seedat, 2008). By applying the Systems Approach to novice drivers, all contributory factors (the driver, other road users the road and the road environment) and influences can be considered in an attempt to explain and understand novice driver behaviour.

3.3. Hazard perception in the context of the road environment

3.3.1. Road design and other spatial considerations

Traditional thinking seems to centre on the notion that although the driving public needs to be taken into consideration, it is very difficult to control the driver, as driver behaviour cannot necessarily be controlled through road design, traffic control devices, or geometry (Lerner et al., 1998). The human element (motivation, perceptions, behaviour etc.) brings about the very uncertainty that needs to be controlled in order to safe guard the driver from harm. Nevertheless, hazard perception and the degree to which the driver perceives and appreciate hazards have always been key considerations in the introduction of interventions and countermeasures designed to prevent crashes.

In order to understand driver behaviour one needs to have an understanding of how awareness, spatial knowledge, and beliefs are accumulated and developed over time. Similarly, how aspects of spatial knowledge and reasoning are similar or different among individuals or groups. Lerner et al. (1998) states that risk perception from a person-oriented approach (motivational, personality factors etc.) that

contributes to dangerous driving is difficult to follow but that from an engineering perspective, it is possible to manage risk on the road.

Research related to road infrastructure should aim to improve designs that lean toward the design of forgiving or self-explaining roads (European Union, 2014). These designs should not only cater for “normal drivers” but should also be appreciative of special road users groups such as elderly and novice drivers. Indications are that the primary inputs into the driving task (that determines workload requirements for the driver) include roadway geometry, traffic conditions, and the roadside environment (Deller, 2013).

In 1998, Lerner et al. stipulated that traffic engineers are able to specify minimum requirements for the design of safe roads and operational procedures however, they are not able to control the human element within the traffic management system. According to Sjöberg et al. (2004), systems should be designed to reduce the amount of risk in different areas including the road and traffic environment.

In 2011, Charlton assisted the New Zealand Government with research pertaining to hazard perception on specific roads. The aim was to identify and characterise specific roads according to the specific hazards experienced. Lerner et al. (1998), developed research program to define, measure and quantify driver perception of hazards as it relates to highway design, operations, and safety, standards for the Federal Highway Administration in the USA. The authors indicate that driver behaviour interact with the road and changes on the road. It is therefore important that drivers have the ability to perceive and react correctly when encountering hazards on the road.

Lerner et al. (2005) state that in general, the design guidelines represent minimum requirements, and are not always appropriate over the full range of roadway users or applications. These design guidelines does not necessarily incorporate human factors. If conflicting requirements (road) exist, it could be difficult for the road user to comply with the road rules.

Safe driver behaviour is linked to the road geometry as the road influences driver perception in terms of safe travel speed. This perception relates to the road characteristics and the level of risk perceived by drivers (Medino and Tarko, 2006). Similarly, Edquist, Rudin-Brown, and Lenne' (2009) indicate that the road environment affect speed choice as drivers adapt their speed to what they perceive as safe and appropriate for the road.

Crundall and Underwood (2001) investigated how novice and experienced drivers extract information from road signs. The research found that novice drivers do not at first, automatically extract information from road signs as experience drivers do, but rather learn to do it over time and with experience.

Experienced drivers, driving on familiar roads or for whom changes in road conditions are familiar, may adapt their driving style to changes in conditions automatically; whereas those less experienced in road driving may react differently, and be more aware of their decisions to change styles (Knight, Iverson and Harris, 2012).

3.3.2. Driving contexts

Hoeschen et al. (2001) assessed novice driver training and training programmes across the European Union. This review highlighted different tasks that novice drivers have to champion. The *first* is control tasks, which is basic vehicle, control tasks and includes, gear shifting and acceleration as well as deceleration, steering and lane keeping, speed control, stopping or braking as well as the use of in-vehicle technologies. The *second* task relates to safe manoeuvres (Hoeschen et al., 2001). Manoeuvres include tailgating to overtake another vehicle, safe overtaking of other vehicles, entering and exiting traffic, lane changing, and reacting to other vehicles as well as other vulnerable road users. The *third* task that novice drivers need to acquire is manoeuvring in relation to the roadway characteristics. In this regard, novice drivers need to learn safe negotiation of curves, hills, and slopes. Similarly, the authors highlight the importance of training novice drivers' for safe interactions at intersections, junctions and –traffic circles. The *fourth* type of task include manoeuvring tasks related to the environment and safe driving amidst conditions such as adverse weather events, night time driving and driving in different environments (Hoeschen et al., 2001).

Borowsky, Oron-Gilad, and Parmet (2010) found that novice drivers tends to increase their speed in complex traffic situations where as experienced drivers reduce their speed in similar driving contexts.

Knight (2012) highlighted differences in the cautiousness of young drivers relating to the character of the area where they live i.e. rural or semi-rural areas. This was associated with the age at which young drivers start to drive and Knight found that those who start driving well below the licensing age were less cautious in different driving situations.

Novice drivers tend to classify hazardous events such as adverse weather and poor road conditions on a scale ranging from not dangerous to most dangerous (Borowsky et al., 2010).

According to previous research, young drivers are more prone to be involved in fatigue related crashes compared to older, more experienced drivers (Pack et al., 1995; Sagberg, 1999). Vlakveld (2011) explains that the reason for this might be that novice drivers do not have the experience or knowledge to stop driving when tired and novice drivers might continue to drive for longer hours without rest than older drivers did. However, in terms of the road, the road design, road environment might also play an important role as monotonous road environments could also potentially contribute to levels of fatigue (Thiffault and Bergeron, 2003).

Driving contexts such as night time driving poses additional risks for novice drivers as research indicate that underage drinking and driving tend to take place at night-time and for this reason a number of graduate licensing programmes pose night time driving restrictions on novice drivers (Association for the Advancement of Automotive Medicine, 2009). Passengers as a distraction are another consideration taken into account by graduate licensing programmes(SWOV, 2012). Durbin et al. (2014) found that novice drivers driving with teen passengers had an elevated risk for fatal crashes and those teen passengers contribute to inattention contributing to non-fatal

crashes. The research also indicated that female drivers tend to be more distracted than their male counterparts. In 2013, Fell, Romano and Voss indicated that in the USA, night time driving restrictions in the 50 States across the USA reduced fatal crashes involving novice drivers at night with 10% and fatal crashes where novice drivers have been drinking by 13%. Passenger restrictions regarding teen passengers also reduced fatal crashes by 9%.

3.3.3. Approach, stopping and sight distances

Stopping sight distance is the distance a vehicle travels between the time the driver sees a problem until the vehicle stops. It is the distance covered as the driver works through the information, decision, and action phases of driving. It also includes the time it takes to stop once the driver applies the brakes. Road designs should provide drivers with enough time to see objects in the road and be far enough away to come to a controlled stop before hitting the object. Intersection sight distance needs to be more as a driver must be able to see far enough to decide whether it is safe to proceed. Intersections require drivers to evaluate a number of factors in addition to traffic speed, for example? (U.S. Department of Transportation, 2004).

D'Addario (2014) states that driver perception-response time is important as this can provide engineers with guidelines for road design. Driver perception-response time can ensure that provision for adequate sight distances to allow drivers the opportunity to perceive potential hazards are included in designs. Drivers need to make accurate decisions to avoid the hazard in the road.

Gyawali and Sharma (2013) investigated the behaviour of novice truck drivers and found that the environment as well as infrastructure elements, such as the road condition, geometry, land use, weather, and temporal factors, play a key role in stress causation for these drivers. They also found that driving events such as overtaking and turning manoeuvres caused stress in the novice drivers and was mainly associated with the size of the truck. Recommendations included authorities taking cognisance of engineering issues that affect novice truck driving behaviour such as the improvement of intersection geometry, sight distances, and on-street parking

3.3.4. Road side safety and work zones

The roadside area refers to the area between the outside shoulder edge and right-of-way limit. When the driver leaves the roadway fixed objects such as guardrail, trees, or steep embankment slopes might pose danger for the driver. Roadside design is an important safety consideration (U.S. Department of Transportation, 2004). Novice drivers seem to be more prone to distraction and advertisements, bill boards and so forth can contribute to this distraction.

In 1999, the U.S. Congress called upon the U.S. Department of Transportation to create a work zone safety awareness and training campaign targeting young drivers (Opiela et al., 2006). One of the motivating factors was the little attention that driver education programmes at that stage gave to work zone safety. Bham, Leu, Vallati, Mathur (2014) emphasise the importance of understanding driver behaviour in work zones as this can influence effective planning and operation of work zones, work

zone characteristics such as capacity, travel time, user cost and delay, queue length and ultimately safety aspects. Punniaraj (2014) states that work and construction zones affect driver attention and safety as the work zone comprises of a number of different warning signs, barrels, pylons, construction equipment and machines which can create hazards for motorists. In order observe both sides of the road as well as the environment around the vehicle, Punniaraj (2014) states that the driver needs to make use of the rear view mirrors. Frequency of mirror-gazing is an indicator of a person's (driver) attentiveness and previous research (Venter, 2014) have shown that novice drivers tend to not make use of mirrors to scan their environment.

3.3.5. *Speed*

Rudin-Brown and Lenné (2010) state that setting appropriate speed limits for a given road segment currently revolves around authorities' perceptions of the road segment. This include considerations associated with cross section, alignment, and the number and type of abutting developments and traffic; the movement of and potential for conflict with other road users; the road's crash history; and seasonal influences such as peak and vacation traffic. Rudin-Brown et al (2010) emphasise that by providing for more criteria or road information other than just safety, this could influence future decisions regarding speed limits and road design which can potentially reduce crashes on a particular road and enhance road safety overall. In line with the previous statement, Deller (2013) emphasises that drivers select the speed at which they travel as a function of a variety of driving clues and risk assessment, directly affecting the operating speed of that road.

Where differences exist between geometric designs and driver expectations exist, an increase in crash rates is observed. Operating speed is essential when developing a corridor or designing a road. Consistency across the sections of the road along with the expectations of the driver is important to establish a safe, effective, and credible speed limit (Rudin-Brown et al., 2010). Deller (2013) states that the "information density" on the road can have a significant impact on speed choice and perceptions of safe operating speeds. This is because the volume of information from the environment contributes to a driver's mental workload and associated on-road choices.

4. CONCLUSIONS

Internationally, risk and risk perception in traffic have been extensively researched. A number of factors contribute to novice drivers being at risk in the road traffic environment. This concept of risk within novice drivers relates to inter- and intra-personal factors. The review indicates that developmental, social, and cultural influences play a role in novice drivers engaging in risky driving behaviour. Clear indications are that these deficiencies can improve with practice, experience, and different types of training.

However international research pertaining to how the road environment poses possible risks to novice drivers is much less. In the quest to design forgiving or self-explaining roads there is need to consider hazard perception from the perspective of special groups such as novice drivers as the available research indicate that novice

drivers tend to err due to the information they receive from their immediate driving environment. The use of information boards, variable message signs, normal road signs that experienced drivers are used to, could in fact be influencing novice drivers' behaviour and their ability to correctly anticipate and react to hazards negatively. Pockets of South African research make reference to the young people and their behaviour in traffic, but do not yet explain novice driver behaviour in a South African driving context per se. There is a need for local research in order to understand South African novice driver behaviour that is cognisant of all socio-demographic indicators as well as factors influencing the culture of driving in South Africa.

5. WAY FORWARD

This research topic is relatively new to South Africa. Despite calls for the development of a hazard perception test and driving restrictions there is no scientific evidence of what these should like within the South African context. The proposed research aims to provide input into baseline information for research that could potentially form recommendations for the development of a hazard perception test and driving restrictions. This investigation will contribute to better comprehend influences of cultural differences on hazard perception and situational awareness in South Africa. It also aims to address the interface between hazard perception and road design in South Africa. By understanding novice driver perceptions regarding risk in the SA driving context, it becomes possible to better address and design forgiving road environments.

REFERENCES

- Borowsky, A. Oron-Gilad, T and Parmet, Y, 2010, 'The Role of Driving Experience in Hazard Perception and Categorization: A Traffic-Scene Paradigm', *World Academy of Science: Engineering and Technology*, 66, pp. 305-309.
- Borowsky, A., Shinar, D. and Oron-Gilad, T, 2010, 'Age, skill, and hazard perception in driving', *Accident Analysis and Prevention*, 42, pp. 1240–1249.
- Carter, P.M., Bingham, R., Zakrajsek, J. S., Shope, J. T. and Sayer, T.B, 2014, 'Social Norms and Risk Perception: Predictors of Distracted Driving Behavior Among Novice Adolescent Drivers', *Journal of Adolescent Health*, 54, pp. 532-541.
- Charlton, S. G, 2011, '*Improving Driver Awareness of Road Risk and Driver Behaviour Using KiwiRAP Ratings*'. TERNZ Research Report., Auckland, Transport Engineering Research NZ.
- Chokotho, L.C., Matzopoulos, R. and Myers, J.E. "Drivers' risk profile indicates the need for a graduated driving licence in South Africa." *The South African Medical Journal* 102, no. 9 (2012): 749-751.
- De Craen, S., Twisk, D.A.M., Hagenzieker, M.P., Elffers, H. and Brookhuis, K.A, 2007, 'Do young novice drivers over estimate their driving skills?', *Young researcher seminar*. Brno Czech Republic, SWOW.

Deller, J, 2013, 'The influence of road design speed, posted speed limits and lane widths on speed selection—a literature synthesis', *Australasian Transport Research Forum* . Brisbane, Australia, pp. 1-10.

Edquist, J., Rudin-Brown, C.M. and Lenne', M.G, 2009, '*Road design factors and the interactions with speed and speed limits*, Contract Report, Victoria, Australia Monash University Accident Research Centre.

Endsley, M.R, 2000, 'Theoretical Underpinnings of Situational Analysis: a Critical Review ', In *Situation Analysis and Measurement*, by M.R. Garland and D.J. Endsley, Mahwah, NJ, Lawrence Erlbaum and Associates, pp. 1-24. Fleiter, J. J., Watson, B., Lennon, A., and Lewis. I.M, 2006, 'Significant Others, Who Are They? - Examining Normative Influences on Speeding', *Australasian Road Safety Research, Policing and Education Conference* 37 (4). doi:10.1525/aeq.2006.37.4.cover.

Galovski, T.E. and Blanchard, E.B, 2004, 'Road rage: a domain for psychological intervention?', *Aggression and Violent Behaviour*, 9(2)pp. 105-127.

Gyawali, S., and Sharma, A, 2013, 'Stress during Driving for Novice Truck Drivers', *Transportation Research Board Annual meeting*, Washington D.C., pp.1-20.

Harris, P.B., and Houston, J.H, 2011, '*Recklessness in Context: Individual and Situational Correlates to Aggressive Driving*', Rollins College.

Hoeschen, A., Verwey, W., Bekiaris, E., Knoll, C., Widloither, H., De Ward, D., Uneken, E., Gregersen, N.P., Falkmer, T., and Schelin H, 2001, '*TRAINER Inventory of driver training needs and major gaps in relevant training procedures*', Final Report, Commission of the European Communities - Competitive and Sustainable Growth programme.

Hollopeter, N., Brown, T., and Thomas, G, 2012, 'Differences in Novice and Experienced Driver Response to Lane Departure Warnings that Provide Active Intervention' *Proceedings of the Human Factors And Ergonomics Society 56th ANNUAL MEETING*. Boston, USA, pp.2216-2220.

Knight, P.J., Iverson, D.C. and Harris, M.F, 2012, 'Cautiousness in young rural and semi-rural drivers: are there influencing factors?', *Australasian College of Road Safety. Journal*, 23(3), pp. 12-19.

Kohn, M.D., William F. Skinner, W.F., Massey, J.L., and Akers. R.L, 1985, 'Social Learning Theory and Adolescent Cigarette Smoking: A Longitudinal Study', *Social Problems*, 32 (5), pp. 455–73.

Lerner, N., Benel, D., and Dekker, D, 1998, '*Understanding driver performance variability and perception of risk: driver hazard perception research plan*,' Final Report, McLean, VA: Federal Highway Administration.

Lerner, N., Llaneras, R., Smiley, A. and Hanscom, F, 2005, '*Comprehensive Human Factors Guidelines for Road Systems*' NCHRP Web-Only Document 70 (Project 17-

18(08)) ,National Cooperative Highway Research Program, Transportation Research Board.

McKay, MM., Coben, J.H., and Larkin, G.L, 2003, 'Driving Beliefs and Behaviors of Novice Teen Drivers and Their Parents: Implications for Teen Driver Crash Risk', *Annual Proceedings / Association for the Advancement of Automotive Medicine, Association for the Advancement of Automotive Medicine*, 47, pp. 197–214.

Medino, A.M.F. and Tarko, A.P, 2006, 'Relationships between road design, driver behavior, and crashes in four-lane highways', *Fourth LACCEI International Latin American and Caribbean Conference for Engineering and Technology*, Mayagüez, Puerto Rico, pp. 1-12.

Miles, D.E. and Johnson, G.L, 2003, 'Aggressive driving behaviors: are there psychological and attitudinal predictors?', *Transportation Research Part F* 6(6) 147–161.

Moutchou, F., Cherkaoui, A. and El Kursi, E.M, 2012, 'Integrating humans factors in the analysis of the tram-car drivers', *CETRA 2nd International Conference on Road and Rail*.

National Highway Traffic Administration, 2008, *National Motor Vehicle Crash Causation Survey- Report to Congress*, Virginia,U.S Department of Transportation.

Opiela, K.S., Sant, B.M., and Childer, J.A, 2006, 'Turning Young Drivers Into Survivors." *Public Roads'* FHWA 70(. 2).

Pack, A.I., Pack, A. M., Rodgeman, E., Cucchiara, A., Dinges, D.F. and Schwab, C.W, 1995, 'Characteristics of crashes attributed to the driver falling asleep', *Accident Analysis and Prevention*, 27(6), pp.769-775.

Punniaraj, K, 2014, '*Assessing The Effects Of Work Zone Configurations On Drivers' Visual Attention*',Masters degree thesis, Anna University.

Redshaw, S, 2004,'Theories of Driver Behaviour and Driving Emotions', *Road Safety Research, Policing and Education Conference*,Sydney,University of Western Sydney, pp.1-10.

Rudin-Brown, C.M.and Lenné, M.G, 2010, 'Driving simulation to support road safety policy: Understanding crash risks to better inform speed setting guidelines', *Australasian Road Safety Research, Policing and Education Conference*, Canberra, ACT, pp. 1-9.

Sagberg, F, 2009, '*Age differences in car drivers' hazard perception skills: A syntheses of results from two studies using a video-based test*',TØI report 1015/2009, Oslo: Institute of Transport Economics, Gaustadalléen.

Scott-Parker, B., Watson, B., and King, M.J,2009, 'Understanding the Psychosocial Factors Influencing the Risky Behaviour of Young Drivers', *Transportation Research Part F: Traffic Psychology and Behaviour* 12 (6), pp. 470–82.

Scott-Parker, B, 2012, 'A comprehensive investigation of risky driving behaviour of young novice drivers', PhD Thesis, Queensland University of Technology Centre for Accident Research and Road Safety.

Scott-Parker, B., Barry Watson, B., King, M.J., Hyde, M.K, 2014, 'I drove after drinking alcohol' and other risky driving behaviours reported by young novice drivers', *Accident Analysis and Prevention*, 70, pp. 65-73.

Scott-Parker, B., Hyde, M.K., Watson, B.C., & 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, pp.242-250.

Sinclair, M, 2014, 'Safe Roads for Youth, Part II BASELINE REPORT, P.A.U. Education, Barcelona.

Sukhai, A., and Seedat, M, 2008, Adverse Driving Behaviours: The Case of Aggression, Excessive Speed and Alcohol Impairment., *Crime, Violence & Injury Prevention in South Africa*, pp. 77–104.

SWOV, 2012, 'SWOV Fact Sheet Young Novice Drivers', Leidschendam, the Netherlands accessed online on the 23 January 2015 [attps://www.swov.nl/rapport/Factsheets/UK/FS_Young_passengers.pdf](https://www.swov.nl/rapport/Factsheets/UK/FS_Young_passengers.pdf).

Sjöberg, L., Moen, B., and Rundmo, T, 2004, *Explaining risk perception. An evaluation of the psychometric paradigm in risk perception research*, Norwegian University of Science and Technology, Department of Psychology, Trondheim, Norway.

Styles, J., Imberger, K., Catchpole, J, 2005, 'Understanding risk taking by young male drivers', Research Report, ARRB, Vermont South.

Thiffault, P. and Bergeron, J, 2003, 'Monotony of road environment and driver fatigue: a simulator study', *Accident Analysis and Prevention*, 35, pp. 381-391.

U.S. Department of Transportation, 2004, 'Road Safety Fundamentals', Federal Highway Administration.

Underwood, D., and Crundall, G, 2001, 'The priming function of road signs', *Transportation Research Part F* 4, pp.187-200.

Vermaak, L, 2000, 'Children Moving Road Safety Technology Into the Future: School Pet (Participatory Educational Technologies)', *South African Transport Conference*, pp.17–20.

Venter, K, 2014, 'An Exploratory Study into South African Novice Driver Behaviour', Masters Thesis, University of Stellenbosch.

Young, K. & Regan, M., and Hammer, M, 2007, 'Driver Distraction: A Review of the Literature', *Distracted Driving, Australasian College of Road Safety, Sydney, NSW*, pp. 379–405.