Vehicle advertisement:

12. What are your first impressions of this advertisement?

13. How does this advertisement make you feel/think?

14. Who do you think this advertisement was designed for?

15. Do you have any other comments or opinions that you would like to share about this advertisement?

Review of contributing factors and interventions for dangerous driving

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Abstract

This paper reviews published research relevant to understanding dangerous driving. A systematic search of relevant databases identified 117 papers that considered driving behaviour, but only 12 that specifically discuss factors that influence dangerous driving, motivations for dangerous driving, and/or interventions to improve road safety in dangerous drivers. The general findings of these studies are discussed, although it is concluded that the use of the term 'dangerous driving' by researchers is typically restricted to the driving behaviour of younger and/or novice drivers. As such a larger body of literature relevant to the topic will not be identified by searches that are restricted to the use of specific terminology. Nonetheless, these searches reveal that the best evidence exists for the implementation of Graduated Driver Licensing programs and the identified studies do highlight a number of key contributing factors that should be addressed in any attempt to reduce dangerous driving.

Keywords

Dangerous driving, Interventions, Systematic review, Alcohol and Drugs, Graduated Driver Licensing

Introduction

In 2004 the World Report on Road Traffic Injury Prevention identified that approximately 1.2 million people worldwide die each year as a direct result of crashes, and up to a further 50 million people are either disabled or injured. Although only a proportion of these crashes are a direct result of dangerous driving [1], road traffic accidents are the eighth leading cause of death in Australia [2].

The personal, social, and economic costs of crashes caused by dangerous driving are immense [3], highlighting the need to identify ways in which traffic related deaths and injuries can be prevented. A pre-requisite for the development of effective intervention, however, is an understanding of those variables that are associated with dangerous driving, as well as knowledge about the features of the most effective interventions. The aim of this paper is, therefore, to systematically identify what is known about those factors that contribute to dangerous driving and to describe the types of interventions that have been shown to be the most effective.

Methodology

A systematic review of the literature was conducted using methods consistent with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [16]. The Academic Search Complete database, one of the leading sources of peer-reviewed research in the Social Sciences and Humanities, was used to identify relevant papers and studies. Seven key terms were used (see Table 1), with each hit being classified into a final pool of studies after the abstract had been reviewed. The term 'dangerous driving' is widely used to refer to intentional risky driving, but has both lay and legal (e.g., the operating of a motor vehicle in a manner which has as one of its inherent qualities the exposure of the public to harm or injury) meanings. Accordingly, other search terms such as 'hoon driving behaviour' and 'hoon attitudes' were also used in an attempt to reflect the currency of this terminology in Australia (e.g., Victoria's Road Safety Amendment [Hoon Driving] Act 2010).

To be retained in the final review, a paper needed to be: (i) peer reviewed; (ii) written in the English language; (iii) full text accessible; (iv) published between 2004 and 2014; and (v) consider factors that influence dangerous driving, motivations for dangerous driving and/or interventions to improve road safety in dangerous drivers. The reference lists of extracted articles were examined to identify relevant articles not identified in the initial searches. A total of 117 published papers met the search criteria, describing a range of different types of study (e.g., review articles, empirical studies) (see Table 1). Each paper was then manually reviewed, independently, by two researchers to establish the relevance of content to the aims of this review prior to inclusion.

Table 1. Search terms used to identify relevant studies for inclusion in the review

Search Number	Key Terms	Total Hits	Selected Hits
1	Dangerous Driving Attitudes	14	3
2	Hoon Driving Attitudes	0	0
3	Hoon Behaviour Attitudes	0	0
4	Dangerous Driving Interventions	10	1
5	Dangerous Driving Programs	19	2
6	Dangerous Driving Laws	74	6
Total		117	12

Results

A total of 12 studies were retained in the analysis. These were grouped into three categories, with four papers relevant to *factors that influence dangerous driving*, three papers relevant to *motivations for dangerous driving*, and four papers relevant to *interventions* (see Table 2). These are described below.

Factors that influence dangerous driving

Four studies investigated factors that influence dangerous driving. The first study by Illiescu and Sarbescu [1] investigated whether age, gender, professional driving and traffic offences differed significantly in relation to dangerous driving behaviour. A total of 953 participants completed the Dula Dangerous Driving Index (DDDI) questionnaire. Dangerous driving was shown to be more common among males, among individuals without

Table 2. Studies identified as relevant to the review aims

Search Number	Source	Selection Criteria Met	Aims
1	O'Brien & Gormley (2013)	Motivations	To compare the inhibitory functioning of young drivers who have been caught speeding and those who have not.
1	Isler, Starkey, & Sheppard (2011).	Intervention	To compare the benefits of higher-order driving skills training and vehicle handling skills training.
1	McCarthy & Peterson (2009)	Factors	To test whether experience with driving, and experience with drinking and driving will effect changes in cognitions.
4	Ho & Gee (2008)	Motivations	To identify the motives that underlie dangerous driving.
5	Simons-Morton et al. (2006)	Intervention	To examine the effectiveness of the checkpoints programme.
5	Dula & Geller (2003)	Definitions	To address the definitional ambiguity of dangerous driving.
6	Iliescu & Sarbescu (2013)	Factors	To examine dangerous driving in relation to a number of relevant factors.
6	Marcotte et al. (2012)	Factors Interventions	To examine differences in self-reported dangerous driving between adolescent binge drinkers and a matched sample of non-binge drinkers.
6	Nelson, Atchley, & Little (2009)	Motivations	To identify patterns of mobile phone use while driving.
6	Harrison (2011)	Motivations	To examine the prevalence of text messaging while driving.
6	Kelly, Darke, & Ross (2004)	Factors	Reviewed literature on drug driving prevalence, effects on driving, risk factors and risk perceptions.
6	Yamamura, E. (2008)	Interventions	To explore the impact of formal and informal deterrence on driving manners.

professional driving experience, and among those with a history of traffic offences. Dangerous driving was not associated with age. It should be noted, however, that this study administered the same questionnaire at different times and in different settings, such as individually or in groups, which may have influenced the validity and reliability of the data.

The next study identified level of alcohol consumption as a factor that contributes to dangerous or risky driving. In order to test the differences between risky behaviour in binge drinkers and non-binge drinkers, Marcotte et al. [5] asked participants about high-risk driving behaviours and driving outcomes. Car crashes and traffic infringements were more commonly reported by younger people who were binge drinkers than those who were not. They were also found to be more likely to engage in speeding, running yellow lights, passing in no-passing lanes and racing cars. However, this study involved a small sample size (n = 38) and as such, these findings require replication with larger samples to confirm their validity.

The third study in this group, by McCarthy and Pederson [6], also examined the association between alcohol and dangerous driving by investigating changes in cognitions about drinking and driving as a result of driving experience and experience with drinking and driving. A total of 266 participants completed a questionnaire measuring drinking and driving behaviour, being a passenger of a drinking driver, drinking and driving attitudes, normative beliefs and perceived negative effects at two points in time, approximately seven months apart. The results supported the hypothesis that drinking and driving behaviour were associated with particular attitudes towards driving; however the authors were not able to determine whether this was a direct result of having experience with driving or having experience with drinking and driving.

The final study identified drug use as an important contributing factor to dangerous driving. Kelly, Darke and Ross [7] conducted a comprehensive review on this issue, with a focus on risk factors and perceptions, effects of drugs on driving performance, and the prevalence of drug driving. Drug use was determined to be an increasing problem in relation to being involved in crashes. They cited evidence that suggests that the prevalence of drug-related car crashes had increased from approximately 20% to 27% over a six year period, with other studies showing the prevalence as being up to 25%. The most common drug detected was cannabis, which has been demonstrated to impair an individual's driving performance by affecting attention, short-term memory, reaction time, decision-making, co-ordination and concentration. When combined with alcohol or other drugs, these impairments become even stronger and more significant.

Motivations for dangerous driving

A total of three studies were identified which investigated motivations underlying dangerous driving. First, Ho and Gee [2] examined the motives that underlie dangerous driving in a sample of 200 young males. Initial exploratory factor analysis of the Motives for Dangerous Driving Scale (MDDS) identified three specific motives for risky driving that were labelled as 'driving fast/risk taking'; 'confidence in one's driving skills'; and 'disrespect for traffic laws'. These factors were supported by confirmatory factor analysis.

Another specific motivation that may contribute towards dangerous driving is the use of a mobile phone. A study by Nelson, Atchley, and Little [8] attempted to establish the patterns of mobile phone use, perceived risk, types of calls and individual motivations. It also aimed to investigate the perceived importance of the call, emotionality of the call, and how often the calls were answered as opposed to initiated. A questionnaire was completed by 372 undergraduate students at Kansas University, all of whom reported at least occasionally talking on the phone while driving, and nearly three quarters of whom (72%) reported that they engaged in text messaging while in control of a vehicle. These findings are consistent with those reported by Harrison [9] who found that 91% of people had engaged in sending a text messaging while driving. Participants also reported that they were less likely to answer a phone call if they felt that the situation was dangerous, unless they believed that the call was of a high level of importance (in which case they would take the risk and answer the call). What the authors referred to as 'subjective norms' were also identified as a significant predictor of mobile phone use, with respondents reporting that they were more likely to talk on the phone and drive if the passengers in their car also believed that this was acceptable behaviour.

Interventions

A total of four studies were identified which investigated current interventions targeting dangerous driving. The effectiveness of formal and informal deterrents on crashes was investigated in a study by Yamamura [10]. Yamamura focused on the effects of the formal and informal deterrents on attention/inattention and dangerous driving, concluding that formal deterrents do not affect dangerous driving but do increase the level of attention that the driver pays. In comparison, informal deterrents were not shown to affect attention levels but were found to reduce the levels of dangerous driving behaviour. Although this study provides some examples of deterrents, it does not provide any specific definitions of 'formal' and 'informal' deterrents, which may lead to different interpretations by different readers.

One intervention that has been widely implemented is the Graduated Driver Licensing program. This approach involves three stages for new drivers to go through: a period of supervised learning; a period of driving under supervision in high-risk conditions; and then obtaining an unrestricted licence [5]. Since the implementation of this program Californian crash rates have reduced to levels that are approximately 30% lower than other states. This program thus appears to be an effective intervention strategy in reducing crashes for young drivers, however it is recommended that additional interventions are provided for those who are prone to binge drinking [5].

A different intervention that requires a large amount of parental cooperation is the Checkpoints Program that was implemented in Connecticut, USA. This intervention is designed to increase the limits that parents place on teenagers in relation to high-risk conditions. It involves a parent-teen driving agreement that encourages parents to limit their child's exposure to 'high-risk' situations, such as having teenage passengers in the car. As the young driver demonstrates that he or she is behaving in a responsible manner and gains driving experience, these restrictions are slowly removed. Simons-Morton et al. [11] reported the results of a randomised control trial involving 3,743 teenagers who had recently obtained their licenses. Participants were randomised either to the intervention group, receiving newsletters, a video, and Checkpoint materials or to the control group, who received standard driver safety information. After three, six and twelve months, both parents and teenagers were required to participate in a phone survey. The results indicated that this program did lead to modest positive improvements in driving behaviour but that these improvements were unlikely to significantly reduce the number of crashes that occur. It is, however, possible that the passive mailing of program materials may not have been powerful enough to motivate parents and teenagers as much as might be required in order to have a significant impact on crashes. Secondly, all data collected was subjective, either from the parents or the teenagers' perspective, and therefore the program may not have been followed as closely as was intended. Simons-Morton et al. did, however, suggest that combining this program with Graduated Driving Licensing may increase its overall effectiveness [11].

Human factors play a role in the majority of crashes, which makes using education and training to improve driver behaviour extremely important. A study by Isler, Starkey and Sheppard [12] involving thirty-six young New Zealand drivers sought to determine whether on-road driving performance, hazard perception, attitudes towards risky driving and driver confidence were significantly affected as a result of either higher-order driving skills training or vehicle handling skills training. Participants were randomly split into either one of the forms of training or a control group that received no training. In order to determine the effects of the training, a detailed driving assessment was conducted both before receiving the training and after its completion, as well as each participant completing a self-report questionnaire and hazard perception test. Results indicated that individuals who received higher-order driving skills training displayed significant improvement in hazard perception and the composite driving measure, safer attitudes towards dangerous overtaking and close following, and a reduction in driver-related confidence. In comparison, those who completed the vehicle handling skills training did not show any improvement in attitudes to risky driving, hazard perception or driver confidence. However, improvements were displayed in the composite driving score, on-road direction control and choice of speed.

Discussion

This review sought to identify what is known about those factors that contribute to dangerous driving, as well as what is known about effective intervention. Factors identified in the published literature that appear to contribute towards dangerous driving behaviour are gender, level of professional driving experience, traffic offence history, alcohol consumption, and drug use. Four different antecedents for dangerous driving were identified: driving fast/risk-taking, confidence in driving ability, disrespect for traffic laws, and mobile phone use. Finally, of the four studies that evaluated interventions to prevent dangerous driving, Graduated Driver Licensing led to a reduction in crash rates of approximately 30%, whereas other programs (e.g., Checkpoints, higher-order driving skills training, and vehicle handling skills training) produced less positive effects. It is not surprising then that the Graduated Driver Licensing is regarded as one of the most effective strategies to improve road safety [14].

The searches identified only a small number of papers that were relevant to the aims of this review. The studies that were identified varied in their methodological quality and involved different designs, sample sizes, and measures making it impossible to synthesise the results or make clear statements about the effect sizes associated with different interventions. Clearly, more extensive and systematic research is required before more sophisticated questions about, for example, the accumulative effects of interventions that focus on licensing and those that focus on changing driver attitudes or skills, can be answered. Nonetheless, this review does suggest that effective intervention strategies should be aimed at male drivers, irrespective of age, who do not have professional driving experience. It also draws attention to the significant percentage of dangerous drivers who are prone to binge drinking and/or cannabis use and these factors are likely to be important to the development of the most effective intervention strategies and deterrents. The key areas that might be usefully targeted in psycho-educational programs are driver risk-taking, over-confidence in driving skill, disrespect for traffic laws, and the use of mobile phones.

It is quite possible, however, that these conclusions are a function of the specific search terms and the particular search engines/databases that were utilised and that some relevant studies were not identified. For example, the Australian Road Safety Research, Policing and Education Conference and the ACRS conference have published relevant papers which were not identified in these searches (see Appendix). Furthermore, the search terms used may have limited the number of positive hits. It was surprising, for example, that no papers related to 'Hoon Driving Attitudes' and 'Hoon Behaviour Attitudes' were identified, and yet there is a small body of published work directly relevant to this area [13]. It would further appear that the term 'dangerous driving' is commonly used in the published research to refer to the driving behaviour of younger and/or novice drivers and, as such, it is misleading to suggest that that the literature identified in these searches can be

applied beyond this group. In other words, this paper only reports literature that specifies the content as "dangerous driving" and does not identify the larger body of research that might be relevant to understanding driving behaviour more generally. For example, Dula and Geller [4] suggest that there are three classes of dangerous driving: negative emotions while driving; intentional acts of physical and/ or psychological aggression towards other road users; and risk-taking behaviours, which they define as dangerous behaviours performed whilst in control of a vehicle without the intention of self-harm or the harm of others. These suggestions, along with the conclusions of this review require further testing.

In conclusion, systematic reviews use transparent procedures to find, evaluate and synthesise the results of relevant research in a way that makes research knowledge more readily accessible [15]. The resulting information is likely to have particular value for policy makers who are interested in understanding what the term evidence-based intervention might mean in this context. The results of these searches suggest two things. Firstly, the need for researchers to use consistent terminology when investigating dangerous driving. Secondly, and perhaps most importantly, the need for the further evaluation of those interventions which are identified as 'promising', such that a stronger and more robust evidence base supporting their implementation can emerge.

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