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Bad behaviour or societal failure? Perceptions of the factors contributing to drivers' engagement in the fatal five driving behaviours

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ABSTRACT

The so-called 'fatal five' behaviours (drink and drug driving, distraction and inattention, speeding, fatigue, and failure to wear a seat belt) are known to be the major behavioural contributory factors to road trauma. However, little is known about the factors that lead to drivers engaging in each behaviour. This article presents the findings from a study which collected and analysed data on the factors that lead to drivers engaging in each behaviour. The study involved a survey of drivers' perceptions of the causes of each behaviour and a subject matter expert workshop to gain the views of road safety experts. The results were mapped onto a systems ergonomics model of the road transport system in Queensland, Australia, to show where in the system the factors reside. In addition to well-known factors relating to drivers' knowledge, experience and personality, additional factors at the higher levels of the road transport system related to road safety policy, transport system design, road rules and regulations, and societal issues were identified. It is concluded that the fatal five behaviours have a web of interacting contributory factors underpinning them and are systems problems rather than driver-centric problems. The implications for road safety interventions are discussed.

1. Introduction

The term 'systems thinking' describes a philosophy currently prevalent within safety science that provides expansive theories and methods to support accident analysis and prevention activities (e.g. Leveson, 2004; Perrow, 1984; Rasmussen, 1997). Whilst there are various tenets, contemporary models are underpinned by the notion that safety and accidents are emergent properties arising from nonlinear interactions between multiple components across entire systems (e.g. Leveson, 2004). This creates a shared responsibility for accidents that spans actors at all levels of systems, up to and including the government.

In the last decade, the potential utility of applying systems thinking in road safety research and practice has been recognised (Larsson et al., 2010; Salmon and Lenné, 2009; Salmon et al., 2012). There is now a growing consensus that further reductions in trauma may be achieved by applying systems thinking approaches in road safety research and practice (Hughes et al., 2016; Larsson et al., 2010; Salmon and Lenné, 2015). This is becoming increasingly relevant given the recent plateau in fatality and injury reductions in many jurisdictions, as well as the fact that in many countries the road toll is increasing. In Australia, for example, from 2015 to 2016 the number of fatalities per 100,000 population increased by 6%. This trend appears to be continuing in 2017 (BITRE, 2017). Systems thinking proponents argue that existing approaches have reached a ceiling in terms of effectiveness and are now experiencing diminishing returns. This is in part due to the changing nature and increasing complexity of road transport systems (Hughes et al., 2016; Larsson et al., 2010; Salmon and Lenné, 2015).

The traditional road safety approach involves the "3 Es" of education, enforcement, and engineering. Examples of this approach can be seen in the interventions used to address the so-called 'fatal five' behaviours known to lead to crashes and road trauma: drug and drink driving, distraction and inattention, failure to wear a seat belt, speeding, and fatigue. Generally, interventions use education,

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enforcement, or engineering with the intention of improving road user knowledge and behaviour so that engagement in the fatal five behaviours is reduced. Critics of this approach have focussed on its reductionist basis, whereby the road transport system is artificially isolated from its broader environment (e.g. society), broken into smaller, discrete parts (e.g. road users, vehicles, and roads) and attempts are made to optimise these parts under the assumption that the system will perform better as a result. Many have also argued that there are contributory factors outside of the driver, vehicle and road infrastructure that cannot be addressed through the 3 Es (Hughes et al., 2016; Newnam and Goode, 2015; Salmon et al., 2012, 2016).

Systems thinking proponents argue that the behaviour of road users is impacted by many other factors and that there is a complex web of interacting factors that lead to drivers engaging in the fatal five behaviours (Salmon et al., 2016). Although some of these factors relate to the individual driver (e.g. personality, risk tolerance, complacency), others likely reside elsewhere in the road transport system (e.g. at the governance and regulatory level). As a result, education, enforcement and engineering will have some impact; however, systemic factors will not be dealt with and so drivers will continue to engage in undesirable behaviours, albeit perhaps to a slightly lesser extent. A final important element of systems thinking is that the behaviour of road users can be influenced by factors extrinsic to the road transport system itself. This suggests, for example, that broader societal issues may also be playing a key role in drivers' engagement in certain fatal five behaviours (e.g. drug and drink driving).

In response to calls for a better understanding of the factors that create road trauma, researchers have applied systems theory-based methods to investigate the causes of road trauma and to design new interventions (e.g. Cornelissen and Salmon, 2013; Hughes et al., 2016; Newnam and Goode, 2015; Newnam et al., 2017; Parnell et al., 2017; Salmon et al., 2016). The overriding philosophy is that the entire road transport system needs to be optimised, not just the individual components acting within it (e.g. road users, vehicles). Whilst initial crash studies have shed new light on the system-wide causes of road trauma, a criticism is that many have focussed only on a single crash event or on existing crash data only (e.g. Newnam and Goode, 2015; Newnam et al., 2017; Salmon et al., 2013). Notably, existing crash data systems have not been able to provide data on crash contributory factors outside of the road user, their vehicle, and the road environment. This has impacted the generalisability and validity of findings and has raised the requirement for further research utilising other data sources (Salmon and Lenné, 2015; Salmon et al., 2016).

This article describes a study designed to go beyond limited accident data and investigate the factors that influence drivers' engagement in the fatal five behaviours. The study involved the use of a driver survey and an expert workshop to gather data on drivers' and road safety experts' perceptions of the causes of the fatal five behaviours. The findings from both were then mapped onto a recently developed systems model of the road transport system in Queensland (Qld), Australia (Salmon et al., 2016). The aim was to identify: (a) what factors lead to drivers engaging in each of the fatal five behaviours; and, (b) where these factors reside in the road transport system. The intention was to identify areas of the road transport system outside of drivers, vehicles and the road environment that would benefit from interventions designed to reduce crashes associated with the fatal five behaviours.

2. Road transport 'systems'

A contribution of systems thinking-based road safety research has been to provide detailed models of road transport systems. These models depict road transport systems as a series of hierarchical levels comprising multiple interacting stakeholders (Parnell et al., 2017; Salmon et al., 2016; Young and Salmon, 2015). As well as road users, their vehicles their environment and widely known road safety stakeholders, these models also include various other actors and organisations involved in transport system design and operation all the way up to and including the government. A key implication is that crash contributory factors reside across these actors and levels of the system; however, it has been consistently noted that data relating to these contributory factors is sparse (Salmon and Lenné, 2015).

A limitation of existing systems analysis models is that they only describe the road transport system of interest and do not consider where in the road transport system crash contributory factors reside. The study described in this article addresses this by building on previous work undertaken by the authors in which a systems model of the Qld road transport system was developed (Salmon et al., 2016). Salmon et al.'s (2016) control structure model of the Qld road transport system shows the actors and organisations who operate within it along with the control and feedback relationships that exist between them. The present study is an important extension to Salmon et al.'s work as the original model does not include any data on the factors that contribute to road crashes. A key requirement for implementing systems thinking in road safety research is to use systems analysis models to identify crash contributory factors as well as where these reside in the road transport system. Whilst much is known about contributory factors related to drivers, vehicles, and the road infrastructure, few studies have examined contributory factors from the higher levels of the road transport system (Larsson et al., 2010; Salmon et al., 2012; Salmon and Lenne, 2015). The original model presented in Salmon et al. (2016) therefore provides a suitable framework to support identification of such factors. The present study involved identifying such factors and them determining which level of the model they are associated with.

Salmon et al.'s original model, including system design and construction and system operations control structures, is presented in Fig. 1 and a description of each of the levels from the operations side is presented in Table 1. Within Fig. 1, downward pointing arrows and associated text represent control mechanisms imposed by actors and/or organisations at the level above on actors and/or organisations at the level below. For example, police officers at Level 4 impose control on the road users at Level 5 via monitoring, enforcement and penalties. Likewise, at Level 1 federal and state parliaments impose control on the level below (government agencies, industry associations, user groups, and the courts) through legislation. Control relationships also exist between non-adjacent levels (as represented by curved arrows). For example, the Department of Transport and Main Roads, situated at Level 3, imposes licensing and registration controls on road users at Level 5.

The dashed arrows pointing upwards represent feedback mechanisms whereby actors and organisations provide information regarding the status of the system to the levels above. For example, 'Government reports' are a feedback mechanism provided by Level 2 (government agencies, industry associations, user groups and the courts) to Level 1 (parliament and legislatures). Crash reports are provided to police officers (Level 4) by road users (Level 5) who were either involved in the crash or witnessed the crash. Feedback mechanisms exist between adjacent levels of the control structure (shown by straight dashed arrows) and between non-adjacent levels (shown by curved dashed arrows).

The control structure model suggests that there are likely multiple interacting factors that the lead to drivers engaging in the fatal five behaviours (related to inappropriate, deficient, or absent control and feedback mechanisms) and that these factors will span all levels of the system. The present study aimed to identify what these factors are and where they reside within the Qld road transport system. These aims were achieved through the conduct of two studies:

1. *Survey of driver perceptions on the causes of each fatal five behaviour.* Participants completed surveys designed to elicit their perceptions on why drivers engage in each of the fatal five behaviours; and
2. *Road safety subject matter expert workshop.* Six road safety experts took part in a workshop designed to elicit their perceptions on the causes of each fatal five behaviour.