A framework for conceptualising traffic safety culture

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A B S T R A C T

Traffic safety culture is a relatively new concept which has recently gained attention in the field of traffic safety. There is currently little consensus regarding the nature of the concept, nor how it should be defined. Preliminary definitions have typically focussed on specific road safety problems and the anticipated effect of a strong traffic safety culture. The literature to date has tended to emphasise how traffic safety culture might be created or shaped. However, without a better understanding of the nature and structure of traffic safety culture, discussions regarding changes to traffic safety culture are restricted. An examination of different conceptualisations and definitions of organisational safety culture provides a preliminary theoretical framework for traffic safety culture. Two high risk driving behaviours within the Australian context are compared to illustrate how key factors within this framework can be used to understand and improve road safety outcomes.

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1. Introduction

In an AAA foundation for traffic safety workshop on traffic safety research needs, the concept of traffic safety culture (hereafter TSC) was identified as a priority for research in the United States (AAA (Ed.), 2007). Though the concept of cultural effects on driving had been introduced as early as 15 years prior to this workshop (Zaidel, 1992), TSC had received little, if any, scientific attention. Whilst safety culture is a common concept in organisational safety (hereafter organisational safety culture, OSC), the application of safety culture to traffic safety was new. Since this workshop, TSC has begun to receive attention within the literature, yet there is little consensus about the nature and content of TSC. It is also unclear (1) how TSC may differ from OSC; (2) of what components or factors TSC is comprised; and (3) to what extent it is possible to change a TSC. For TSC is to be of benefit to traffic safety, it is necessary to address these issues. Moeckli and Lee (2007) stated that the manner in which TSC is defined by the traffic safety community will dictate the "courses of action taken in the effort to decrease fatalities, injuries, and property loss" (p. 60). Thus, it is important to engage in academic discussion surrounding the nature of TSC in order to benefit future road safety initiatives.

2. Organisational safety culture

As TSC is an emerging concept, it is useful to first consider what has been learnt in the field of OSC and how this might be applied to TSC. Safety culture was first identified by the International Nuclear Safety Advisory Group (INSAG) in a report following the 1986 Chernobyl nuclear power plant disaster. Amongst other causal factors, INSAG reported that a lack of safety

culture, both within the Chernobyl plant and nationally, contributed to the incident (INSAG-1, 1986, as updated in INSAG-7, 1992). Five years later, INSAG provided the following definition of OSC:

> "Safety culture is that assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance."
>
> [p. 1; INSAG, 1991]

Despite clearly labelling a lack of OSC as being responsible for the disaster, there was little academic background provided for the concept. Thus, researchers began to explore OSC, how it could be measured and, if possible, how it could be used to improve safety. Despite much research in the field, there remains to be a widely-accepted definition of OSC (Guldenmund, 2000; Hopkins, 2006). Guldenmund (2000) highlighted that this has led many researchers to re-define OSC in relation to their specific area of interest. Thus, a number of factors have been identified in the literature relating to OSC, including organisational management systems, policies and procedures, job design, work pressures, training, employee involvement in decision making, and perceptions and attitudes regarding the work environment (Arboleda, Morrow, Crum, & Shelley Ii, 2003; Choudhry, Fang, & Mohamed, 2007; Cox & Cheyne, 2000; Grote, 2008; Håvold, 2010; O'Toole, 2002; Parker, Lawrie, & Hudson, 2006).

Nævestad (2009) discussed two common approaches to OSC, the interpretive and functionalist approaches. The interpretive approach conceptualises OSC as shared patterns of meaning which influence safety. This approach advocates the use of qualitative research to understand the underlying cultural causes of behaviour. These cultural meanings typically encompass shared beliefs, attitudes and values, which may be directed to broad concepts such as the likelihood of incidents (e.g. fatalism or denial) and valuing personal experience over reported truths (Hopkins, 1999; Håvold, 2010). There is, however, very little literature which uses either this approach or qualitative research to study OSC (Glendon, 2008). The functionalist approach is the dominant approach in OSC practice and research. Functionalist researchers tend to identify shared behaviours and then use either safety climate (the aggregate perceptions of organisational safety structures and systems), or theories from social and organisational psychology, to identify organisational factors which influence these behaviours (Guldenmund, 2000; Nævestad, 2009). When shared psychological factors are considered by functionalist researchers, they typically use a narrow focus on attitudes directed either towards specific behaviours or organisational structures and systems. Functionalist researchers advocate changing these factors in order to create or improve an OSC. Thus, of the two main approaches used to understand OSC, one emphasises changing behaviour (or, as is commonly stated, 'changing culture') through the use of organisational structures and systems, while the other emphasises understanding deeper cultural meanings, beliefs, attitudes and values which are seen to motivate behaviour.

Despite different approaches, there is agreement that an OSC which positively influences safety is an organisational culture which prioritises safety-related beliefs, values and attitudes (Cooper, 2000; Guldenmund, 2000; Short, Boyle, Shackelford, Inderbitzen, & Bergoffen, 2007). Thus, OSC can be argued to be a product of organisational culture, and not a culture in itself (Antonsen, 2009; Choudhry et al., 2007; Guldenmund, 2000; Haukelid, 2008; Hopkins, 2006). Organisational culture, however, is often conceptualised in terms of views of culture found in anthropology and cultural psychology. Schein (1990) argued that any group with a significant shared history may have developed a culture and, as such, organisational culture is simply the culture shared by members of a given organisation.

In order to understand OSC, it is thus necessary to explore these traditional views of culture. Edwards, Davey, and Armstrong (2013) explored how traditional conceptualisations of culture have been applied within OSC. Three conceptualisations of culture, previously identified and reviewed by Brinkmann (2007), the normative, anthropological and pragmatic conceptualisations, were seen to have been applied to differing extents within the OSC literature. These conceptualisations roughly align with either the interpretive (anthropological) or functionalist (normative and pragmatic) approaches to OSC. Due to the different strengths and weaknesses of each conceptualisation, none provide a complete understanding of OSC. Therefore, it was argued that these conceptualisations could be viewed as facets of a single, larger conceptualisation of OSC (Edwards et al., 2013). Edwards et al. (2013) then proposed the "synthesised conceptualisation of safety culture", defining OSC as:

> "the assembly of underlying assumptions, beliefs, values and attitudes shared by members of an organisation, which interact with an organisation's structures and systems and the broader contextual setting to result in those external, readily-visible, practices that influence safety"
>
> [Edwards et al., 2013; p. 77]

3. Traffic safety culture

A number of similarities can be observed between OSC and TSC. First, despite driving culture (Zaidel, 1992) and organisational culture predating the emergence of these concepts, OSC first emerged from the Chernobyl disaster and TSC emerged from a perceived lack of priority placed on traffic safety within the United States (AAA (Ed.), 2007). Thus, both fields were initially born out of a problem, rather than from theory, requiring researchers to subsequently explain the theoretical nature of the concept. After the AAA workshop, the foundation engaged the traffic safety community develop a definition of TSC. This led to a compendium being published in 2007, which forms the bulk of the existing literature on TSC. In the preface

of the compendium, a number of statements were made regarding the TSC of the United States, which serve as the earliest descriptions of TSC. It was suggested that, despite 43,000 fatalities each year, there is a general failure to appreciate "the full implications of these tragedies", and a lack of implementation of proven traffic safety countermeasures able to halve the annual number of fatalities (AAA, 2007). The prevailing TSC in the United States was described as "a culture that accepts loss of life and limb as a price of mobility" (p. ii; AAA, 2007). From these descriptions, the perceived problem which provided the impetus for investigating TSC appears to have been a prevailing acceptance of fatalities, a level of inaction despite viable intervention options being available, and a sense of fatalism. In many ways, this mirrors the INSAG description of a lack of safety culture surrounding the nuclear power industry and the need for safety to receive the attention warranted by its significance (INSAG-4, 1991).

Throughout the AAA compendium, significant discussion focussed on strategies for changing a TSC. This resembles functionalist approaches to OSC, which emphasises improving safety by changing OSC. However, little attention was given to defining TSC, and only a small number of indirect definitions were provided in the compendium. McNeely and Gifford (2007) indicated that TSC is an aspect of the larger culture within which driving occurs. For this reason, they argued that traffic safety interventions generally aim to alter the norms, attitudes and actions governing traffic safety. Moeckli and Lee (2007) highlighted the relationship between national cultural values and traffic safety, linking cars to the American values of freedom, individualism, self-realisation, prosperity and progress. They provided a "common" definition of culture as consisting of "the beliefs, values, norms and things people use, which guide their social interactions in everyday life" (Moeckli & Lee, 2007; p. 62). Thus, TSC consists of elements of national culture which influence traffic safety. Given that OSC is also linked to traditional views of culture, TSC and OSC are arguably be based upon the same theoretical principles.

Lonero (2007) defined two concepts that were suggested to relate to TSC. The first was road safety's cultural paradigm, consisting of "the implicit shared values and beliefs that determine the way in which the society organizes and acts to assure safe, sustainable mobility" (p. 14). The second was driving culture, consisting of "common practices, expectations, and informal rules that drivers learn by observation from others in their communities" (Lonero, 2007; p. 7). Despite the distinction between these concepts, both share the core elements of beliefs, attitudes and values.

The TSC descriptions and definitions above appear to rely heavily upon an interpretive approach to culture, through emphasising shared beliefs, attitudes and values which are argued to motivate behaviour. However, within the OSC literature, interpretive-based definitions are common and it is predominantly in the transfer to research and practice that an emphasis on organisational factors emerged. That is, though OSC is typically defined using interpretive frameworks, it is commonly operationalized in a functionalist manner. Thus it is worth noting the few AAA compendium papers which began to lay the foundation and aims for future research.

Whilst advocating the goal of improving safety by changing TSC, Allen and Mercer (2007) suggested that it was necessary to first understand the existing culture. It was argued that, in order for public education to be a beneficial tool for change, it is first necessary to understand what the public already knows, believes and values. Girasek (2007) also emphasised the importance of identifying shared beliefs, attitudes and values which are in opposition to improved road safety, including beliefs regarding the effectiveness and appropriateness of government spending on further road safety initiatives, and the belief that crashes are caused by carelessness or stupidity. A number of potential factors were suggested to contribute to these beliefs, ranging from political ideology to personal biases in the perceived likelihood of an incident. By exploring and identifying the attitudes, beliefs, or biases that are in opposition to evidence-based safety initiatives, it was argued that researchers could develop strategies to best to improve traffic safety. Thus, these two papers align with the interpretive approach to OSC, by emphasising shared beliefs, attitudes and values, rather than structures and systems.

In addition to the AAA compendium, Girasek (2011) has taken a first step towards operationalising and measuring TSC. However, from his working definition of a positive TSC as "a social climate in which traffic safety is highly valued and rigorously pursued", and in the factors which were identified, this study can be viewed as an operationalisation of traffic safety climate rather than culture. Whilst there is some disagreement within OSC literature as to the differences between OSC and organisational safety climate, the latter is typically viewed as shared perceptions regarding the working environment. As such, whilst safety climate surveys reflect attitudes and perceptions, their primary purpose is to identify weaknesses in organisational structures and systems. Thus, despite his earlier emphasis on beliefs, attitudes and values (D.C. Girasek, 2007), Girasek's (2011) paper appears to align with functionalist views of OSC.

One key difference between TSC and OSC can be seen in the extent to which those responsible for managing safety in the respective domains can influence the behaviour of individuals. In the organisational domain, managers and supervisors have a high degree of power and are typically able to tightly monitor the behaviour of workers. Conversely, whilst it is arguable that government departments responsible for road safety regulations have a greater degree of authority over drivers, in that they can impose sanctions on offenders, they typically have a reduced ability to monitor drivers due to the number of road users and the geographical diversity of the road network. Thus, functionalist approaches to TSC, which emphasise management, structures and systems, may represent an insufficient means to explain and modify road safety, whereas interpretive approaches, which emphasise shared psychological variables, would be more robust to these differences. The interpretive and functionalist views of OSC have often been presented as opposing groups of thought, with authors generally adhering to one approach (Nævestad, 2009). However, Edwards et al. (2013) argued that this divide is neither necessary nor beneficial, as cultural beliefs and values interact with contextual factors to influence behaviour. Whilst the tendency toward one or the other approach was evident in the discussed TSC literature, Williams and Haworth (2007) advocated an approach emphasising both contextual and cultural factors. By comparing Australia and the United States, a number of factors were suggested

by Williams and Haworth to account for the differing safety performance of these two nations. The two primary differences which were identified related to the structure of government and the general public's attitude towards government. Indeed, they argue that traffic safety is influenced both by government structures and systems, and public attitudes. This is consistent with conceptualisation of OSC presented by Edwards et al. (2013).

As can be seen from the above discussion, there are many similarities between OSC and TSC. Given the similarities both conceptually and in the current state of literature, the following adaption of Edwards et al.'s (2013) definition of OSC can be provided for TSC:

Traffic safety culture is the assembly of underlying assumptions, beliefs, values and attitudes shared by members of a community, which interact with a community's structures and systems to influence road safety related behaviours.

4. The boundaries of the community

The second issue highlighted at the start of this paper was the need to develop a better understanding of components or factors which comprise TSC. This is partially addressed through the provided definition of TSC, which indicated that TSC encompasses shared beliefs, attitudes and values which interact with a community's structures and systems. Thus, it is important to explore both shared beliefs, attitudes and values (cultural factors) and relevant community structures and systems (contextual factors) which influence safety-related behaviours. However, it remains unclear what specific cultural and contextual factors are relevant to safety behaviours on the road. If TSC is merely an application of safety culture to traffic safety in the community, the specific contextual factors which comprise TSC are contingent upon the nature of the target community. Additionally, shared beliefs, attitudes and values may differ from one community to the next. Wiegmann, Von Thaden, and Gibbons (2007) suggested that it is important to identify the boundaries of the culture under investigation in order to identify relevant factors. Nævestad and Bjornskau (2012) also stated that the very concept of community is ambiguous and can refer to nations, local communities, and even peer groups.

Wiegmann et al. (2007) attempted to translate OSC to traffic safety, identifying societal analogues of OSC indicators. These included government as senior management, driving instructors and police as operational personnel and supervisors, traffic incident reporting as the formal safety system, and driver norms as the informal safety system. However, whilst these factors are relevant to TSC, they may apply at various levels of a community. For example, behaviour may be influenced by national, state and regional government branches. Thus, it is necessary to identify the community level, or levels, at which TSC may influence behaviour, in order to identify relevant contextual factors. The remainder of this section examines previous research which supports the application of TSC to either nations or intra-national groups.

4.1. TSC and national communities

In an attempt to identify the best analytical unit for the TSC concept, Naevestad and Bjornskau (2012) examined its potential application to national communities, local communities and peer groups. The local community was argued to be too ill-defined and varied to be suitable for analysis. Conversely, nations were suggested to have well-defined boundaries, and past research has shown that national cultures influence safe behaviour. A number of researchers have examined differences in traffic incidents and fatalities between national cultures. Lund and Rundmo (2009) identified differences in risk perception, risk sensitivity and risk willingness between Norway and Ghana. Özkan, Lajunen, Chliaoutakis, Parker, and Summala (2006) examined links between driver perceptual-motor and safety skills, and the numbers of traffic incidents and penalties across six European and Middle Eastern nations. In addition to differences in these skills, the relationship these skills had to safety outcomes differed across nations. Wells and Beynon (2011) demonstrated links between road traffic deaths and national-level corruption, as a proxy for road-rule breaking. These studies, revealing marked differences in factors related to road safety between nations, highlight the potential benefit of applying TSC to communities at a national level.

The work of both Hofstede (see Hofstede, 1980; Hofstede, Hofstede, & Minkov, 2010) and Triandis (see Triandis, 1996) provides a useful approach to understanding national cultural influences on behaviour. Hofstede (1980) explored the differences in work-related behaviours between different cultures (defined by the nation within which the organisation was located). It was found that four key "cultural dimensions" (individualism–collectivism, power distance, uncertainty avoidance, and masculinity), could explain many observed differences in work behaviours. In more recent research, additional dimensions (such as indulgence and long-term-orientation) have been added to these original four dimensions (Hofstede et al., 2010). Though not explicitly examining differences in behaviour, Triandis reconceptualised these dimensions as cultural syndromes, defined as "a pattern of shared attitudes, beliefs, categorizations, self-definitions, norms, role definitions, and values that is organized around a theme" (p. 408). Whilst previously identified cultural dimensions may be relevant to traffic safety, there may be TSC-specific dimensions yet to be identified. For example, within cultures that have historically been nomadic, or have a low population density spread over a large geographical location, there may be a higher value placed on timely mobility, thus a cultural dimension which measures the level of this value may be relevant to road safety. Future research across multiple jurisdictions is necessary to identify such dimensions. Regardless of the specific cultural factors which may influence road safety related behaviours, the research of both Hofestede and Triandis demonstrates the importance of nationally-shared beliefs, attitudes and values, for behaviour.

Lajunen, Corry, Summala, and Hartley (1998) suggested that cross-national differences in road safety may also be influenced by elements which are not strictly culture-dependent. For example, differences in traffic law enforcement, road design, and geographical influences on vehicle usage, may all play a significant role in road safety, despite being distinct from the shared beliefs, attitudes and values of a culture. Therefore, it is also necessary to examine national contextual factors which influence safety. Within national communities, Naevestad and Bjornskau (2012) highlighted that governments can influence behaviour through police enforcement, public education, and driver licensing and training. When considered together, the above findings highlight that there can be international variance in road safety, which may be influenced by both nationally-shared cultural factors, and national structures and systems. Thus, nations may serve as a beneficial target community for operationalising TSC.

4.2. TSC and intra-national communities

Despite highlighting the importance of national contextual factors, Naevestad and Bjornskau (2012) argued that, due to high levels of intra-national variation in traffic incidents, national TSC may prove insufficiently specific to explain behaviour. Thus, peer groups were explored as an alternative level of TSC analysis. Whilst peer groups can be difficult to define, it was argued that they were the most fruitful unit of analysis as peers may have the most immediate effect on driver behaviour. It is, therefore, important to consider whether intra-national communities may serve as a better unit of analysis for TSC.

A number of studies have examined intra-national differences in road safety. Nordfjaern, Jorgensen, and Rundmo (2012) examined cultural and socio-demographic predictors of crash incidents in Norway, Ghana, Tanzania and Uganda. Cultural symbol exchange, gender and age were found to be more relevant to incident variability than the nation in which they occurred. Differences in attitudes between rural and urban regions in the United States have also been found to influence fatal crashes (Rakauskas, Ward, & Gerberich, 2009); however, in Norway, attitudes have been demonstrated to explain individual, though not regional, variance (Eiksund, 2009). Similarly, in addition to higher risk-taking and limited experience, research has shown that young driver fatality rates may be influenced by cultural and contextual factors (Tilleczek, 2004). Further, qualitative investigation of motorcyclists within Queensland, Australia, revealed a strong group influence of "fellow riders" on behaviours (Tunnicliff, Watson, White, Lewis, & Wishart, 2011). Together, the above findings suggest that there are cultural and contextual variations related to geographical, peer group, age and gender sub-populations or communities within nations. This highlights the lack of specificity achieved by viewing nations as a homogenous unit. Thus, there is merit to the suggestion that TSC should focus on intra-national communities.

4.3. National, intra-national or nested communities

The above discussion highlights that there is value in studying TSC at both national and sub-group (within nation) levels. The principal problem which led to the AAA discussing the concept of TSC was a perceived societal "complacency" and failure to prioritise safety (AAA, 2007). It is arguable that a perceived national problem cannot be solved solely through specific sub-groups within a nation. Further, focussing solely on peer groups may result in failure to account for broader national factors. However, a solely national perspective may overlook a significant degree of cultural and contextual influences on behaviour. Thus, it is important to adopt a holistic perspective taking into account both national and sub-group influences.

The importance of examining smaller cultural groups within a larger unit is not unique to TSC. Antonsen (2009) noted that definitions and research of OSC rarely take into account the sub-cultures within an organisation. Organisational cultures may be comprised of a number of sub-cultures (Frost, Moore, Louise, Lundberg, & Martin, 1991; Martin, 1992). Even when using a solely functionalist approach, organisations may display a number of differing policies and practices between branches. Thus, both key aspects of OSC (cultural beliefs, attitudes and values, and contextual influences) may differ between sub-cultural units. Within a nation there are a number of local communities, and an even greater number of peers groups. Thus, rather than choosing the best unit of analysis, TSC should be conceptualised in terms of nested cultures and contexts.

This concept of nested cultures has seen some attention within previous literature. For example, Ward, Linkenbach, Keller, and Otto (2010) suggested TSC use the social ecological perspective on culture (Dahlberg & Krug, 2002), which disaggregates individual, relationship, community and societal factors. It was argued that safety strategies should target multiple levels of influence. Using Australia as an example, safety strategies should therefore be targeted at (1) national; (2) state; (3) regional; (4) local; and (5) peer group levels. Further, it is important to recognise road user sub-groups which extend beyond typical geographical and social boundaries, such as Tunnicliff et al.'s (2011) identification of "fellow riders". Within many of these levels, there will be cultural beliefs, attitudes, values, expectations and norms, as well as contextual factors such as education, policies and enforcement. Whilst the specific factors present within TSC at each level require further investigation, the concept of nested cultures could form a basis of such research.

5. Can culture be shaped?

Having provided a definition and conceptual framework of TSC, and having identified the importance of looking at multiple levels of analysis, it is worth considering how TSC can serve to improve road safety. Though seemingly intuitive at face value, this has been the topic of much discussion within OSC research. The principal issue is the extent to which TSC can be

changed. If it is possible to change a TSC, then research needs to identify the contextual and cultural factors which should be modified to bring about the change. However, if it is not possible to change a TSC, it is important to consider whether the concept hold sufficient utility for the road safety community. It is thus beneficial to examine the results of past efforts to shift attitudes and behaviours related to road safety. Two examples of past efforts in Australia to shape traffic safety behaviour, drink driving and speeding, provide an interesting contrast. As specific behaviours, these two form a subset of the broader range of behaviours which may be influenced by TSC and, thus, the beliefs, attitudes and values which relate to these behaviours form components of the wider TSC.

Importantly, the purpose of discussing these behaviours is not to characterise the TSC in Australia, but discuss the relative changes that have been witnessed in the beliefs, attitudes and values related to these behaviours. It is impossible to directly characterise or describe the Australian TSC without specific, targeted, research aimed at this purpose. Nonetheless, in order to provide a context within which to understand these behaviours and their related beliefs, attitudes and values, it is beneficial to understand some characteristics of the general Australian culture using Hofstede's dimensions.

According to the Hofstede et al. (2010) Australia scores low in power distance and high in individualism, together meaning that Australians expect a more equal relationship with those in authority, and are expected to look out for themselves. Further, Australia scores high in indulgence, meaning that people seek to enjoy life and wish to act and spend money in a way that pleases them. Lastly, Australia is considered a masculine society (one in which people strive to be their best, rather than for quality of life and care for others), and scores low in uncertainty avoidance (people are willing to take risks and try new ideas and technologies). Regarding the potential impact of these cultural dimensions on traffic safety, it can be hypothesised that Australians may be more resistant to on road enforcement (power distance and individualism), more likely than many other nations to engage in sensation seeking (indulgence), more influenced by safety messages directed at personal costs and benefits (masculinity and individualism), and more willing to accept new types of road safety initiatives (uncertainty avoidance).

Within Australia, drink driving is typically described as having a blood alcohol content in excess of 0.05% whilst driving a vehicle. Australia has been considered to be a leader in anti-drink-driving enforcement and education through the application of random breath testing (RBT) as well as sustained media campaigns (Bates, Watson, & Soole, 2012; Haworth & Johnson, 2004). The changing prevalence of drink driving in Australia over the last few decades, along with the associated change in community attitudes and values toward the behaviour, has been described as a TSC "success story" (Watson & Soole, 2013).

Speeding can be defined as either driving at speeds that exceed the posted speed limit, or at speeds which are not safe for the given conditions. For the sake of the current discussion, speeding will be treated as exceeding the posted speed limit. There is some evidence that on-going enforcement and public education efforts across Australia have impacted the extent of speeding and related crashes as well as related attitudes and values. However, this effect has been much less pronounced than that for drink driving, and speeding has been characterised as a TSC "work in progress" (Watson & Soole, 2013).

Government interventions for drink driving and speeding have used a similar approach within Australia, consisting of enforcement and public education campaigns. Both behaviours have been the target of significant enforcement aimed at deterring drivers from speeding or drink driving. For anti-drink-driving enforcement, RBT has been extensively conducted in a highly visible fashion to promote general deterrence (the deterrent effect on the general population resulting from the threat of punishment). With regards to speeding, police in all Australian jurisdictions employ a variety of speed enforcement approaches, which promote general deterrence, yet also serve a specific deterrence effect (the deterrent effect of past experiences of punishment). Two main approaches to public education and media campaigns have also been used for both behaviours. The first is targeted at reinforcing the purpose and nature of enforcement, and the second at transforming cultural norms and attitudes to increase moral attachment to the law (Watson & Soole, 2013). Despite using similar approaches for both behaviours, the changes seen in behaviour and attitudes have differed.

5.1. Drink driving within Australia

RBT legislation was first introduced in Victoria in 1976, although the first intense application of this enforcement technique did not occur until 1982 in New South Wales. By the end of 1988, RBT was the primary form of enforcement in all Australia states and territories and, when coupled with regulatory and education-based campaigns, dramatic reductions in drink driving rates were achieved (Homel, 1988). The introduction of RBT in New South Wales immediately reduced drink driving rates by 25% (Homel, McKay, & Henstridge, 1995). Additionally, between 1977 and 1992, the percentage of drivers fatally injured with a blood alcohol content of 0.05% or greater was decreased from 49% to 21% (Moloney, 1995). Continued reduction in drink driving rates has been sustained throughout Australia. While intensive enforcement techniques continue to produce impressive results, this reduction may also be the result of changing perceptions regarding the seriousness of drink driving resulting from transformative education. It has been proposed that public education and media campaigns can be complementary to enforcement techniques (Sweedler, 2000), and thus, can change the cultural beliefs, attitudes and values which influence drink driving.

While drink driving still remains one of the top two contributors to road fatalities in Australia (alongside speeding), public attitudes have changed from "one more for the road" to an appreciation of the dangers associated with drink driving and the consequences of enforcement. Research has demonstrated that attitudes towards drink driving within Australia have changed, as a larger proportion of motorists now consider drink driving inappropriate and recognise the social consequences of

this behaviour (Freeman & Watson, 2009; Homel, 1988). For example, a survey of 1197 general motorists in 1971 revealed that approximately half (e.g., 48%) of the sample believed it was acceptable to drink and drive (Henderson & Freedman, 1979), whereas a survey of 780 general motorists in 2005 reported that 71% believed drink driving to be a serious offence (Watson & Freeman, 2007). Internationally, researchers have suggested that drink driving offence rates fluctuate with the level of public attention given to drink driving (Sweedler, 2000), although enforcement efforts can also influence both attitudes and behaviour. While it is difficult to quantify the unique contributions of enforcement and culture in reducing drink driving, TSC related attitudes have clearly changed regarding drink driving in Australia.

5.2. Speeding within Australia

Perhaps more so than any other illegal and high-risk driving behaviour, there is substantial resistance to changing speeding behaviours and community attitudes to speeding and related enforcement. This occurs in spite of a number of evaluations suggesting speed cameras are effective in reducing crashes (Pilkington & Sanjay, 2005; Wilson, Willis, Hendrikz, Le Brocque, & Bellamy, 2010). There is a commonly recognised paradox between speeding attitudes and behaviour, with many drivers reporting speeding on a regular basis, despite holding negative attitudes toward speeding (Fleiter, 2010; Fleiter & Watson, 2006). In a large survey of Australian drivers, Petroulias (2011) reported that while the majority of drivers acknowledged that speeding increases the risk and severity of crashes (70% and 92%, respectively), almost a third of surveyed drivers (28%) believed that speeding is acceptable if motorists drive safely. Thus, despite a general recognition of the dangers of speeding, the relationship between safety and speed is sometimes questioned, and speeding behaviour persists.

5.3. Explanations for the difference between drink driving and speeding

A number of factors may help to, at least partially, explain the difficulties associated with changing TSC when comparing speeding to drink driving. First, due to the transient nature of speeding, drivers may believe that they have more control over the consequences of their behaviour (Horswill & McKenna, 1999). Compared to drink driving, where a driver will most likely remain inebriated for the entirety of a trip, speed is a more fluid behaviour. This may account for lower levels of perceived risk associated with speeding (Read, Kirby, & Batini, 2002), particularly when exceeding the speed limit by small amounts (Elliott, 1992). Second, the majority of speeding drivers frequently engage in the behaviour without experiencing negative consequences. Thus, punishment for speeding lacks certainty and severity, reducing deterrence for some drivers (Elliott, 1992). Third, there is typically a lower perception of the legitimacy for enforcement of speeding behaviour compared to drink driving, with speed enforcement being perceived by many drivers as primarily serving a revenue-raising aim (Elliott, 1992; Petroulias, 2011). Fourth, a broader culture of support for speeding is also likely to contribute to this phenomenon. For example, enforcement tolerances communicate that "slightly" speeding is acceptable (Elliott, 1992), vehicle manufacturers develop and release high-performance vehicles capable of exceeding maximum legal speed limits by a considerable margin, and social media depicting speed as desirable or "cool".

Together, these factors produce an atmosphere of general social acceptability of speeding, such that many drivers choose to drive at speeds in excess of posted speed limits, at least some of the time. For example, a number of observational and self-report studies conducted in Australia have shown that speeding behaviour remains relatively prevalent on Australian roads; however, the evidence suggests a tendency for the majority of speeding drivers to exceed posted limits by relatively small to moderate amounts (e.g. within 10% or 10 km/h over the limit), which potentially highlights the impact of enforcement tolerances in many jurisdictions (Glendon, 2007; Glendon & Sutton, 2005; Radalj & Sultana, 2009; Roads & Traffic Authority, 2000; Walker, Bryant, Barnes, Johnson, & Murdoch, 2009).

Whilst these findings have typically been interpreted in the light of theories such as deterrence theory and the theory of planned behaviour, they are also amenable to interpretation through the lens of TSC. In terms of shared beliefs, attitudes and values related to speeding, the above discussion highlights the potential influence of attitudes directly relating to behaviour, beliefs regarding enforcement, and more abstract notions of freedom from restraint. The net effect of these attitudes appears to reinforce speeding. Despite significant attempts to enforce adherence to the speed limit, current enforcement appears insufficient to adequately overcome the current culture.

5.4. Learning from our past

In contrast to drink driving, changing both the speeding behaviours, and cultural beliefs, attitudes and values that relate to speeding, may prove more difficult to achieve and sustain. However, it is unclear whether the lack of sufficient change seen in speeding represents a failure at cultural change, an insufficient time over which change has been attempted, or an inability to deliberately shape TSC. Ultimately, this is a contentious issue even within OSC. Whilst many have argued that managers should aim to create a "positive" or "safe" culture in order to improve safety (e.g. Choudhry et al., 2007; Cooper, 2000; Crum & Morrow, 2002; INSAG, 1991, 1992), others have argued that culture cannot be managed or controlled in a top-down approach (Haukelid, 2008). Even when change occurs, some deeper levels of culture may remain untouched, resulting in reversions to previously acquired behaviour (Nævestad, 2009). However, an uncertain ability to change culture does not necessarily indicate OSC or TSC hold insufficient utility for improving safety. By understanding the existing culture, the context surrounding specific behaviours can be changed to suit a given culture, thereby improving safety (Edwards et al., 2013).

It may never be possible to create an ideal culture, in which members of the community share beliefs, attitudes and values which promote safe behaviour with minimal required contextual input. Further, there may be different combinations of beliefs, attitudes and values which could form such an ideal culture. However, investigating an existing culture can enable the identification of effective safety strategies. Though efforts should still be directed toward altering unsafe aspects of an existing culture, until the prevailing culture has been successfully altered, road safety behaviours can be managed through the use of strategies designed to suit an existing culture.

6. Conclusion

While the concept of TSC is in its early years, it may hold great promise for improving traffic safety. The current paper identified three key issues: (1) how TSC may differ from OSC; (2) of what components or factors TSC is comprised; and (3) to what extent it is possible to change a TSC. Despite TSC's recent emergence, it is evidently very similar to OSC, and may be best viewed as a different application of the same foundational concept. TSC can be defined as the assembly of underlying assumptions, beliefs, values and attitudes shared by members of a community, which interact with the community's structures and systems to influence road safety related behaviours. Dependent on the community under analysis, TSC may include a variety of factors. TSC could be examined at a number of potential levels, and differences in cultural and contextual factors may be present at each level. Thus, within a given nation, there may be a series of nested cultures that together form TSC and its effect on safety. In regards to the extent to which it is possible to change TSC, while some advances have been made in shifting the TSC within Australia, aspects of our success appear to be behaviour-specific (Watson & Soole, 2013). That is, the approach used to reduce drink driving does not appear to have transferred as well to speeding, at least at this point in time. When compared to drink driving, speeding remains a TSC "work in progress". Thus, the extent to which it is possible to deliberately change TSC is unclear, and efforts should be directed towards both attempted cultural change, as well as understanding the prevailing TSC to develop effective road safety strategies.

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