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Addressing Young and Novice-Driver Safety in Great Britain

Developing a systems-based approach

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The Royal Automobile Club Foundation for Motoring Ltd is a transport policy and research organisation which explores the economic, mobility, safety and environmental issues relating to roads and their users. The Foundation publishes independent and authoritative research with which it promotes informed debate and advocates policy in the interest of the responsible motorist.

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Disclaimer

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Foreword

What is it going to take to address the fact that young novice-drivers are significantly over-represented in Great Britain's road safety statistics for deaths and serious injuries? Internationally, greater emphasis is starting to be placed on taking a systems-based approach to young novice-driver safety, which considers how collisions are the outcome of interactions between individuals, organisations, policy and law rather than simply an individual and the immediate environment within which a collision occurs.

We know that age itself is a contributory factor in young novice-driver collisions, teenagers experience biological and neurological changes that affect the way in which they perceive and respond to risk. We can't do much about that. But what we can do – what systems thinking guides us to do – is look more broadly at the whole web of actions and reactions, circumstances and influences, which shape a young novice-driver's behaviour, rather than simply honing in on the point at which they slide behind the steering wheel.

We've made huge strides in road safety over the last thirty years through pursuing a broad range of initiatives, but with the number of road deaths in particular apparently plateauing, it seems unlikely that further pursuit of the same measures will, in and of themselves, deliver a step change.

It is time to think differently.

That is why we commissioned two internationally recognised experts in the field of road safety psychology, Teresa Senserrick and Neale Kinnear, to write this report, which starts to sketch out what a systems-based approach could look like in Great Britain. It also presents the evidence for the most effective types of interventions. The message is clear – the way we identify, analyse and respond to the causes of road crashes needs to be broadened, and it needs to be systematised.

We hope that the report will be widely read and its findings widely debated by all those interested and involved in making our roads safer.

We must do better. Systems thinking shows us how.

Steve Gooding

A handwritten signature in black ink that reads "Steve Gooding". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Director, RAC Foundation

Executive Summary

In Great Britain, young drivers are significantly over-represented in road trauma. Current efforts to address this focus largely on educational initiatives to support the driver licensing system. The licensing process in Great Britain requires knowledge, perception and skill tests to be passed before independent driving is permitted; there are no restrictions that impose any kind of limits on drivers after they have passed these tests. While efforts have been made to improve the safety outcomes of supplementary (pre- and post-test) initiatives, this has proved to be of little or no effect. Advances in research into the underlying causes of novice-driver crash risk provide insights into why such efforts are failing to demonstrate the intended benefits.

Local and international research has confirmed that the greatest contributor to the inflated crash risk of young drivers is in fact their novice status – their lack of driving experience. Novice drivers of all ages are shown to face this inflated risk when they first start driving independently (unsupervised). However, young age is also a contributor, with the youngest novices having further inflated risk. While adolescent development influences that heighten sensation-seeking, and the increased importance of peers at that stage of life, have both long been recognised, the latest research also highlights how brain and hormone changes have an effect in others ways that have particular implications for driving. This includes biological and neurological developmental changes that lead adolescents to be highly susceptible to distractions and also to fatigue, during daytime hours as well as after dark. This has shifted the focus from addressing ‘the problem young driver’ to ‘the young driver problem’.

Despite these advances, the content of many young driver education initiatives in Great Britain continue to focus on knowledge of and attitudes towards traditional risk-taking behaviours, which contribute to only a small fraction of the over-representation. Training efforts focus on vehicle-handling skills for the practical driving test, which has some bearing on how the new driver can drive, but not necessarily on how they choose to drive.

Current approaches in Great Britain therefore place a strong focus on the young driver as the problem. Alternative conceptualisations of road safety in international settings have broadened this perspective in recent times, shifting the focus – or blame – for road crashes beyond the individual. This includes recognition of the role of a wider, shared community ‘traffic safety culture’ that interacts with an individual’s decision-making and behaviour. Wider still is the ‘safe system’ concept, which recognises that, to be safe, individual road users need to operate within a system that also comprises safe roads and roadsides, safe speeds, safe vehicles and safe road safety policies and management.

Most recently, these ‘system’ (singular) conceptualisations have been pushed further by applying even broader ‘systems’ (plural) thinking to the road safety domain. Looked at from a ‘systems-based’ approach, crashes can be viewed as the outcome of interactions between multiple components in a complex sociotechnical system comprised of multiple levels of key actors, with relative roles and responsibilities – an approach long applied in other

transport fields, such as aviation and rail. From this perspective, an initial mapping (scoping of those involved in the system) of the ‘young driver road safety system’ in Great Britain was undertaken and is presented in this report. To take account of broader influences on road safety (such as access to alcohol and employment), higher levels of the system need to be included: government bodies and other organisations beyond those with a transport-related focus; intermediary actors are also involved, and include non-driving-related educational bodies, employers and religious institutions – to provide just a few examples.

Applying a systems-based approach identifies multiple new and innovative pathways to improving young driver safety that go beyond ‘young-driver-centric’ education, training and licensing. The current work is preliminary and discursive; further exploration and expansion of the young driver road safety system in Great Britain is encouraged. Known effective, evidence-based initiatives should be at the core of any developed system framework. The strongest evidence base for preventing young-driver crashes is found in licensing initiatives that seek to mitigate young drivers’ exposure to crash risk. Pre-test, such initiatives include an extended period of learning, with a high amount of supervised driving that encourages depth as well as breadth of experience. Evidence also suggests that hazard perception training can be beneficial at this stage. Post-test licensing initiatives include limiting driving in some of the highest risk conditions for young novices: driving at night, with multiple peer passengers and under the influence of alcohol. This think piece provides examples of how current education and training initiatives in Great Britain could be reframed within an overarching system to focus on supporting these evidence-based risk-mitigation strategies, rather than expecting such initiatives to carry, in isolation, the burden of seeking to improve road safety.

Another broader educational approach to foster risk-mitigation strategies can be found in resilience-based education. This approach focuses on empowering youth, and enhancing their strengths and competencies, particularly identifying and applying strategies to avoid or manage risk generally (not solely within a single domain such as driving or road safety). The focus is also not simply on managing their own risk, but also that of others, such as their friends and peers. Such an approach is increasingly associated with improved driving behaviour and a reduced crash risk.

The initial presentation of Great Britain’s young driver road safety system in this report provides a starting point for the promotion of further mapping of key actors, responsibilities and relationships, and enables promotion of the system in a way that engages these actors so as to optimise efforts to improve youth road safety. Research in other domains suggests that shifting the current focus from the role played by the young driver to higher levels in the system will lead to the greatest safety outcomes. This offers a new focus for efforts to invigorate both traditional and non-traditional actors in improving the road safety of youth.

Ongoing evaluation is necessary for the optimisation of any system, and this will apply to such new efforts over time. Special attention should be paid not only to best practice, in terms of both content and approaches, but also to the feasibility of expanding initiatives that have been found effective in demonstration projects. The way to achieve the desired efficacy, high levels of participation, and maximum safety outcomes will be by ensuring that

the intention and role of the initiatives is well understood and enforceable, where applicable, and that support programmes are in place for those disadvantaged.

The following key recommendations for guiding the future direction of young and novice driver safety are offered:

- Continue to identify key actors, responsibilities and relationships in Great Britain's young driver road safety system.
- Seek to establish improved interactions across and between levels of the young driver road safety system.
- Reframe youth road safety education and training efforts to focus on developmental and inexperience factors that are known to contribute to young novice-driver crashes – more generally, this should include resilience education, and more specifically a consideration of how best to manage the licensing process.
- Reframe young driver training efforts to focus on strategies that manage risks generally, including the minimising of distractions, strategies for managing time and fatigue, and hazard perception training.
- Use education to support risk-mitigating licensing initiatives – specifically, a 12-month learner period, promoting over 100 hours of supervised practice driving pre-test; and post-test restrictions preventing night-time driving, the carrying of multiple peer passengers, and any consumption of alcohol when driving.
- Widen these education efforts to include parents, road safety practitioners and policymakers, and the wider community, so that they understand these youth initiatives and the place that they have within the young driver road safety system, as well as to promote recognition of and improvements to their own contributory roles.
- Ensure that initiatives are well planned and well evaluated (both the process and the outcomes) on an ongoing basis, in order to ensure the efficacy and effectiveness of efforts, such that resourcing of evidence-based initiatives can be prioritised.

Such efforts offer the opportunity to take a new perspective to addressing young novice-driver safety in Great Britain and to greatly enhance young-driver-related road safety outcomes in the future. Given the pervasive role of young driver inexperience and adolescent developmental influences, and the role of wider systems factors in protecting youth on the road, these recommendations have implications for other countries and jurisdictions beyond Great Britain. Collective efforts are now needed to shift the focus on from 'the young driver problem' to 'the young driver road safety system'.

1. Introduction



Young drivers are among the newest drivers on the road; the start of their driving career can be an exciting time in the life of young people, but is also one that can be tinged with tragedy. When it comes to annual figures for road deaths, youth and young adults¹ represent a much larger proportion than the proportion of the population that they comprise. In Great Britain in 2015, 17- to 24-year-old drivers were involved in around 20% of all recorded collisions and represented 22% of all car drivers who died on the roads (DfT, 2016), yet they make up only around 7% of licence holders (DVLA, 2015).

The over-representation of young novice drivers in road collisions has a significant impact on society, emergency services, communities, and the families and friends of those involved in young driver road collisions, who bear a lasting burden of preventable loss. It is this sense of needless waste that often motivates interventions that aim to improve the safety of young drivers.

In Great Britain, the vast majority of these interventions are locally led educational initiatives that run alongside the driver licensing system, which requires new drivers to pass a theory test (including a computer-based hazard perception test) and a practical driving test. Despite these efforts, many novice drivers report feeling unprepared for solo driving following receipt of their full driving licence (Kinnear et al., 2011; RAC, 2013).

¹ In this document, the term 'young adults' and 'young drivers' are used to refer to those aged between 17 and 24 inclusive.

The challenge for such interventions is to bridge both an experience gap and a maturity gap – the leading contributory factors to young drivers' inflated crash risk. By the end of the first year following licensure, an average 17-year-old driver can expect their risk of being involved in a collision to have reduced by 36% as a result of the experience they gain as a driver and by an additional 6% owing to ageing and maturity (McCartt et al., 2009; these figures are calculated on the basis of driving 7,500 miles during that year). Any success in bridging either of these gaps will result in a safety improvement.

Young & novice-driver risks

The interested reader is directed to novice-driver reviews by the RAC Foundation (Box & Wengraf, 2013) and TRL (Helman et al., 2010; Kinnear et al., 2013). A think piece for Road Safety Scotland also offers a comprehensive consideration of the driving risks associated with youth (McKenna, 2010).

Generally, however, most of the current educational interventions fail to address these gaps, and struggle to justify their ongoing implementation. A lack of funding typically strangles the opportunities for good-quality evaluation, and even when evaluations have been conducted, the evidence is at best limited (for a recent review, see Mayhew et al., 2014 and Pressley et al., 2016). Nevertheless, the educational approach continues to be the dominant one in Great Britain in the quest to improve novice-driver safety.

As will be discussed in this think piece, there is no prospect of such (usually short-term) interventions replacing the requirement to learn from on-road experience, nor of them affecting the neurological and biological limitations of maturity. It can even be argued as unfair and misleading to expect those who design and deliver these interventions to bridge gaps that are known to be unbridgeable by such methods (Kinnear et al., 2013).

This think piece is prompted by the need to take a step back and look at the bigger picture. It argues that the dominant focus of research and interventions seeking to inform and educate the young driver of their risk is flawed. Subsequently, this current focus has restricted efforts to the lower levels within an overall system that dictates the environment in which young people enter the driving population, without paying sufficient attention to higher levels. Taking a risk-mitigation approach, establishing roles and responsibilities, and turning attention to the overall system structure – these are the approaches that are likely to provide a framework that education can support. This new perspective on addressing young novice-driver safety is also more likely than the present focus to result in improving the safety of young novice drivers and those with whom they share the road.

2. Why is a New Approach Needed?



Over the past decade or so, the international road safety community has sought to make a shift away from characterising the over-representation of youth in crash statistics as due to ‘the problem young driver’ – the risk-taking youth who chooses to drive recklessly. In fact this caricature represents only a small minority of youth, as has been established in the above-cited review by McCart et al. (2009), which confirmed the much greater relative role of inexperience. The focus therefore has shifted to ‘the young driver problem’; that is, recognition that crash risk is heightened for all young novices.

Advances in understanding adolescent development have also identified additional implications for driving, beyond long-recognised factors such as sensation-seeking and heightened influences of peers. This includes important neurobiological developments that have an effect on the ability to regulate impulses, and therefore increase susceptibility to distractions (Johnson & Jones, 2011). Hormonal shifts delay the ability to achieve quality ‘deep’ sleep to later at night, with a concurrent stabilisation or increase in sleep needs resulting in susceptibility to fatigue during the day, not merely at

night (Carskadon, 2011). Despite these advances, the content of many of Great Britain's educational initiatives for young drivers continues to focus on traditional risk-taking behaviours such as speeding, aggressive driving and driving under the influence of alcohol and other drugs.

Additional to these broader educational initiatives, more-specific training initiatives² tend to focus on basic or advanced vehicle-handling skills. The former include skills that are important for demonstrating safe vehicle handling and therefore for passing the practical driving test. However, such driving does not necessarily represent how one will actually drive when unsupervised post-test. Of greater concern, the latter often focus on how to avoid an imminent crash, and include techniques such as advanced steering and braking manoeuvres aimed at regaining control of a skidding vehicle. These are not only difficult to train to an effective level of competence in a single session, but can result in miscalibration – when drivers perceive their skill level to be greater than their actual skill level – and therefore can lead to greater risk acceptance and ultimately greater crash risk.

Overall therefore, many current education and training initiatives for young drivers are generally misaligned with the key factors contributing to their inflated crash risk, hence fail to produce desired positive outcomes (Mayhew et al., 2014). Contrastingly, licensing initiatives that seek to incrementally manage young drivers' exposure to risk with increasing experience and maturity are the most successful known initiatives in terms of reducing young-driver crashes and injuries to date (Mayhew et al., 2014; Senserrick & Williams, 2015).

When well-intentioned training goes wrong

Examples of the unexpected, counterproductive outcomes of young driver training programmes can be found from Scandinavia and the United States. Loss-of-control crashes actually *increased* for young male trainees after advanced control skills training. A discussion is included in Senserrick and Mitsopoulos-Rubens, 2013 (including Jones, 1993; Katila et al., 1996, 2004).

Graduated licensing systems, generally known more specifically for drivers as graduated driver licensing (GDL), progress novices through stages of supervised to unsupervised (independent) driving, easing restrictions over time. The strongest systems require an extended period of supervised practice driving to address inexperience and particularly restrict alcohol, late-night driving and peer passengers in the early months of independent licensure (Mayhew et al., 2014; Senserrick & Williams, 2015). Analysis of police crash data in Great Britain has demonstrated that even with 50% compliance only, a strong GDL would save several hundred deaths and serious injuries each year (Jones et al., 2013).

² In this document, the term 'education' is used broadly to describe any activity aiming to facilitate learning, while 'training' is used more narrowly to describe instruction that is specific to a certain skill or set of skills.

Is driving a right or a responsibility?

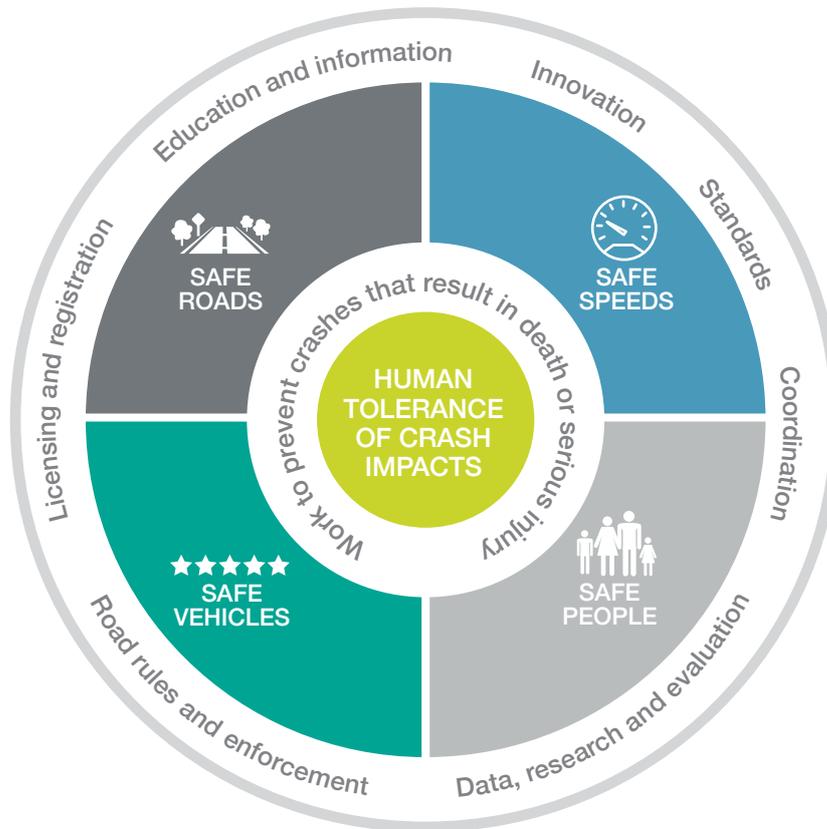
Civil liberties-based arguments view unrestricted access to driving as a 'right' for all. An alternative responsibility-based perspective might pose some pertinent questions: do all road users have a right to function in a road system that does not put them at a high risk of injury, potentially fatal, by allowing others of known significantly higher risk to enter the system without restrictions? What is the right of young drivers themselves to be protected from this known risk? Do parents have a right to expect the system to protect their children from this risk, particularly when evidence-based risk-mitigation strategies are known?

However, some view such initiatives as punitive or otherwise discriminatory towards young people. This outlook stems particularly from a lack of understanding that these restrictions are based on risk management strategies, primarily to counter driving inexperience, rather than to punish all young drivers for the sake of the few who take high risks. Lack of support can also be due to a lack of awareness that driving for work, education and a range of other purposeful driving scenarios (e.g. religious, medical or family needs) are typically exempted from such restrictions, in a way that is readily enforceable (such as by drivers having official course enrolment or employer statements as proof of exemptions available if needed) (Senserrick & Williams, 2015).

Notwithstanding the success of GDL, licensing initiatives as well as education and training initiatives all apply a 'young-driver-centric' approach to addressing 'the young driver problem'. However, the high crash risk of young drivers has wider implications than for the young drivers alone. It has been shown in Great Britain that the majority of those killed in collisions involving a young driver are other people, such as passengers of young drivers, other drivers and their passengers, motorcyclists, pedestrians and cyclists (DfT, 2016). This means that young-driver collisions are a wider road safety problem, one in which others have direct and indirect contributory roles.

Thinking more broadly in this regard, a more recent conceptualisation of road safety that moves beyond individual road users is the 'safe system' (NRSS, 2016). This approach proposes that the road system should be designed so that no individual should be seriously harmed; such design considerations include accounting for human error, such as poor decisions or manoeuvres of a young, inexperienced driver. The focus is not merely on the safe road user, but on safe roads and roadsides, safe speeds and safe vehicles, supported by safe policies and management. Such an approach therefore, does not blame or try to 'fix' individual road users, but to increase safety across the road system, more in keeping with a broad public health perspective. From this perspective, improvements should be made throughout the system to ensure that no individual – young driver or other road user – is harmed. A diagrammatic example of the system (as applied in Australia) is included as Figure 2.1. The safe system approach is in the process of being adopted throughout Great Britain (Highways England, 2014), following successful adoption in other countries throughout the world, including Australia (ATC, 2011) and New Zealand (NZ Ministry of Transport, 2010), following on from Sweden's 'Vision Zero' and The Netherlands' 'Sustainable Safety' models (Senserrick et al., 2011).

Figure 2.1: Conceptualisation of a road safety ‘safe system’



Source: NRSS (2016)

The safe system approach to road safety has been helpful in shifting perceptions of road trauma away from a view that sees it as the ‘fault’ of road users. Most readers will have heard statements attributing road crashes directly to human error as the primary cause (Singh, 2015), generally used to blame drivers in particular for breaking the rules of the road and making poor decisions. However, such use of language generally fails to appreciate that reasons for crashes also include such factors as limitations in human vision (e.g. sight distances, obstructed views), vehicle performance errors (e.g. poor directional control) and attention (e.g. susceptibility to distractions and fatigue); that is, types of human error to which all drivers are prone (Singh, 2015).

The safe system puts this into perspective, and many advances in road infrastructure treatments and vehicle technologies now aim to assist drivers to overcome such human error limitations. However, the safe system also inherently includes a narrow focus on road-related contributors to safety. But looking more broadly, the wider ‘traffic safety culture’ and other factors – such as population changes, level of unemployment, the number, locations and opening hours of alcohol outlets, as well as alcohol and fuels costs, for example – also contribute to crashes (Newstead et al., 2004). Taking as its basis this wider perspective, the next section argues for consideration of a much broader ‘systems-based’ approach (which is different from a safe system approach) to addressing young driver safety – one that expands the potential for countermeasures by reducing the reliance on a young-driver-centric approach.

3. Taking a Systems-Based Approach



Considered independently, every crash represents a failure of the individual; taken together, patterns of crashes represent a failure of the system within which those individuals operate. The consistent over-representation of young drivers involved in crashes inevitably results in the finger of individual blame being pointed at them for youthful exuberance, inexperience and risk-taking. It is much less common for the system in which these young drivers operate to be critically appraised.

As the previous section notes, the young novice-driver problem represents elements of both psycho-social maturation and inexperience. These involve biological and human limitations that apply, at least to some extent, to all young novice drivers. Acknowledging this helps, in part, to explain why traditional driver education and training interventions, undertaken for decades, have continually failed to deliver meaningful results. This is not to completely dismiss their potential input to the development of a road safety culture more generally, but in terms of delivering direct improvements in the safety of young novice drivers, such an individualistic approach has quite patently failed (see Kinnear et al. 2013 and Helman et al, 2010 for reviews).

Researchers have, therefore, started to question whether the continued over-representation of young drivers in collision statistics is something that is an output of the system within which these drivers operate. This being at least possibly the case, it may be necessary to take a systems-based approach to improving young novice-driver safety in Great Britain.

3.1 What is a systems-based approach?

It is important to first be clear about what a systems-based approach is *not*: it is not the same as the safe system approach, nor is it traffic safety culture (another recent trend of interest). While all three are conceptually related, they are distinct; the three concepts are descriptively compared in Table 3.1.

Table 3.1: Descriptions of distinct but related road safety concepts

Safe system	People will make mistakes; roads, vehicles and speeds should be designed to reduce the risk of a crash and protect people in the event of a crash.
Traffic safety culture	"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." (Edwards et al., 2014)
Systems-based approach	Crashes are the outcome of interactions between multiple components in a complex sociotechnical system. Systems thinking aims to understand how different components of complex systems interact.

Source: Authors' own

It is argued that a systems-based approach is more likely to improve the safety of young novice drivers than traditional interventions that by and large attempt to 'fix' the young driver (Scott-Parker et al., 2015; Twisk et al., 2015). Such thinking is consistent with safety-critical industries, where focusing on the individual is considered inappropriate and accidents are considered to represent a failure of the system as a whole (Dekker, 2011).

3.2 The theoretical background

The systems-based approach is not a new concept, emerging as it has from philosophies developed in the early part of the twentieth century. It has evolved in safety-critical domains as the most appropriate way to investigate, understand and prevent accidents, originally in relation to hazardous industrial plants, but long since applied also in other transport domains such as aviation and rail (Rasmussen, 1997; Underwood & Waterson, 2014). The path taken through this evolution has developed and realised the number of layers, with associated disciplines involved and the influences of safety in a social context (see Table 3.2). Risk management paradigms originally started with engineering solutions providing systems and controls within focused environments, for example when using industrial equipment (Rasmussen, 1997). However, accident analysis highlighted the importance of the human-machine interface and human psychological and physiological limitations. Subsequently, organisational sciences sought to understand how management and environmental conditions could influence behaviour and risk. Finally, as management

and societal commitment to safety was found to have an influence on safety, regulation and law became critical components of what is now a complex sociotechnical system (Rasmussen, 1997). The history of risk management research has therefore developed the theoretical basis for understanding how management of risk can be applied beyond controlled industrial settings. This approach is arguably now the dominant model within accident analysis research (Underwood & Waterson, 2014). In this paradigm, accidents are seen as the result of relationships between a system's fundamental parts, rather than in the light of considering parts (e.g. the driver) in isolation.

Table 3.2: Evolution of system layers and examples of related disciplines and influences on safety

Related disciplines	System layers	Influences
Political science; law; economics; sociology; health & safety	Government and policy	Political climate; public opinion; media; finance; lobbyists
Economics; decision theory; organisational sciences	Regulatory bodies and associations	
Organisational sciences; psychology; sociology	Authorities such as management or parents	Regulation; societal and cultural influences; media and marketing; finance
Psychology; sociology	Peers and others	
Psychology; human factors; epidemiology	Immediate actors (e.g. workers or drivers)	Regulation; family; peers; social influences; opportunity; finance; media and marketing
Engineering; accident analysis; health & safety; transport planning	Environment and technology	Regulation; technological advancements; manufacturers; research and development

Source: Authors' own adapted from Rasmussen (1997)

The traditional cause-effect accident model (as commonly applied in road safety and particularly to young drivers) is arguably inadequate. It leads to a focus on equipment or humans at the sharp end of a system, which/who are then incorrectly blamed for an accident (Underwood & Waterson, 2014). Instead, accidents can be more accurately described as emerging from the complex interaction within the normal operational variability within the system in which the user is operating.

An example of this might be the current approach to a collision involving a young driver at night, carrying passengers of a similar age. It is likely that the investigation will identify that the driver lost control, was possibly driving too fast for the conditions, and was possibly influenced by their peers in the vehicle. There may also be consideration for the condition of the vehicle (e.g. whether it was roadworthy) and the environmental conditions (weather, road and traffic). Aside from this, there is little introspection to identify why such a collision has become 'stereotypical'. Simply put, it is only a common crash scenario because the 'system' allows and might even encourage (e.g. in the absence of alternative transport options) exposure to a situation whereby young and novice drivers find themselves at increased risk of being involved in such a collision.

A systems-based approach would seek solutions to mitigate this risk (see Figure 3.1). In this example there are a couple of immediate options. One would be to introduce an extended licensing component that reduces exposure to the high-risk situations (i.e. driving late at night and/or with peer-aged passengers) post-test for the first six to twelve months for newly licensed young drivers. Another option might be to improve and encourage public transport use for young people at night, thereby reducing the motivation to drive. In the Netherlands, for example, a free public transport pass for students was introduced as an initiative to improve access to education. Inadvertently, this resulted in a significant reduction in young-driver crashes, despite this not being the directly intended outcome (Twisk, 2000).

Both options can be introduced at a strategic level and can influence exposure to a known risk; both options have also been evidenced to reduce young-driver collisions in real-world situations (Senserrick & Williams, 2015; Twisk, 2000). The introduction of either measure can also provide a basis for supporting educational initiatives. Rather than education seeking to improve safety directly, using it to support risk-mitigation strategies provides clarity, focus, and a realistic measure for evaluation (e.g. level of knowledge and perceived legitimacy of the regulation). Ultimately a change in one part of the system can be seen to influence all others, and support from all levels of the system will ultimately determine the level of effectiveness.

Figure 3.1: Example of how a systems-based risk-mitigation strategy might be implemented

	Risk-mitigation approach	System layer
	New policy aims to protect newly licensed young drivers by preventing them from driving between 12.00 and 06.00 and/or with passengers under 21 years of age for six months post-test	Government and policy
	Licensing process updated and new regulations supported by associations and police	Regulatory bodies and associations
	Authorities, industry and parents informed and empowered to support and enforce new regulation	Authorities such as parents/guardians
	Perceived legitimacy of change supported by educational initiatives and media campaigns	Peers and others
	Compliance achieved via support and legitimacy from all other layers of the system	Young drivers
	Accident analysis identifies newly licensed young drivers are at greater risk at night and when carrying peer-age passengers	Environment and vehicles
	Telematics options provide support for new regulation	

Source: Authors' own

3.3 Developing a ‘young driver road safety system’

There are various models and structures that can be applied to taking a systems approach to accident causation. One commonly used example is based on Rasmussen’s (1997) Risk Management Framework (RMF). This is a framework that can be modified to the domain of interest, in this case young driver road safety, and has already been applied in Australia (Scott-Parker et al., 2015, 2016). The RMF is based on a simple conceptualisation comprising of six sociotechnical levels. This has been adapted for the current area of interest in Table 3.3.

Table 3.3: Conceptualisation of Rasmussen’s Risk Management Framework for young driver road safety

Level	Domain	Example Factors
1	Government policy	Legislative decisions and actions
2	Regulatory bodies and associations	Implementation of legislation and requirements
3	Proximal authorities	Local authority responsibilities/parents
4	Other influence	Influential others
5	Immediate actors	Young drivers
6	Environment and equipment	Physical environment and vehicles

Source: Authors’ own adapted from Rasmussen (1997)

The levels are fairly self-explanatory, with a narrowing of focus from the top to the bottom; responsibility and system direction typically flows from legislative, policy and budgeting bodies down to local authorities and agencies, to parents and peers, the young driver and finally to the environment in which they act. However, responsibility is considered to flow downwards and feedback upwards across the levels. Decisions made at the higher levels will influence behaviour at lower levels, while information about the current state of affairs should feedback up the levels to inform the decision-making at the higher levels.

Taking a systems-based approach to improving young driver safety therefore removes focus from the young driver as the problem, and from interventions to fix them. Instead it places responsibility on all those within the system to think about how the system interacts and how it has produced the environment in which the young driver is engaged.

Scott-Parker et al. (2015) mapped published international research of factors contributing to young-driver crashes and interventions against these levels and noted that all fell within levels 4, 5 and 6, with the vast majority in level 5, focusing on the young driver. What this tells us is that, as an industry, there has been a great deal of focus on what young driver causation factors increase the chances of being involved in a collision, but very little (in fact none were identified by Scott-Parker et al.) on how legislation, policy and spending at higher levels influences collision outcomes. A summary is shown in Table 3.4.

The traditional, direct approach (e.g. informing young drivers about risk factors and collision outcomes) often seems logical but is consistently ineffective when used on its own. Looking at the problem from a systems-based perspective begins to increase understanding of why this approach is not sufficient. Using interventions which target the young driver only – or narrow bands of the lower levels of the system – in isolation shows a failure to appreciate that such changes are working within a system prescribed from higher levels.

Table 3.4: Risk Management Framework for young driver road safety, noting research and intervention focus to date

Level	Domain	Example Factors	Research Focus	Intervention focus
1	Government policy	Legislative decisions and actions	Minimal	Minimal
2	Regulatory bodies and associations	Implementation of legislation and requirements	Minimal	Minimal
3	Proximal authorities	Local authority responsibilities/parents	Some	Some
4	Other influence	Influential others	Some	Some
5	Immediate actors	Young drivers	Most	Most
6	Environment and equipment	Physical environment and vehicles	Some	Some

Source: Authors' own adapted from Scott-Parker et al. (2015)

It is clear that there is very little research into or understanding of the effectiveness of strategies and interventions from the higher levels. In Great Britain, higher-level interventions have included enhancements to the driving test (e.g. introduction of theory, hazard perception and independent driving) and the New Drivers Act.³ Internationally, higher-level interventions have for the most part involved the introduction of GDL, or components of such systems. Such higher-level interventions are often reliant on support and enforcement by lower-level actors to enhance their effectiveness; for example, GDL regulation is often self-enforced by empowering parents to control the exposure of their young driver. As noted earlier, such higher-level system changes, particularly internationally, have resulted in the greatest recorded safety improvements for young drivers; significant casualty savings have been predicted if a similar approach were to be adopted in Great Britain⁴ (see Kinnear et al., 2013, 2014).

³ The Road Traffic (New Drivers) Act (1995), more commonly known as The New Drivers Act, was introduced on 1 June 1997. Under the Act, drivers accumulating six or more penalty points within two years of passing their practical driving test on their first full driving licence have that licence revoked. Following this they are entitled to hold only a provisional licence until they again pass both the theory and practical driving tests.

⁴ The introduction of a GDL system in Great Britain was predicted in these studies to save 4,478 casualties (433 of these being KSI casualties – killed or seriously injured) and to deliver social and economic benefits valued at £200.1 million each year.

3.4 The actors

One of the first things to do when mapping a system is to establish who is involved in it; these bodies/individuals are referred to as the 'actors'. To do this, it is prudent to develop an 'actor map': this involves identifying all those who influence the system, and then positioning them within the levels of the RMF. Scott-Parker et al. (2016) completed a full study of this in Queensland, Australia. It was not possible to do the equivalent in full for Great Britain for this think piece, although a workshop, hosted by the RAC Foundation in April 2017, afforded the opportunity for input from a selection of experts representing the road safety community in Great Britain. A summary of the actor map developed with the aid of the workshop is presented in Figure 3.2. This is not necessarily an exhaustive or detailed actor map, but it does demonstrate the array of actors involved in the system who all have roles, responsibility and influence on young driver road safety. It is clear from this initial exercise that there is much more to young driver road safety than simply the young driver himself or herself. The next step would be to identify an exhaustive list of actors and to agree the responsibilities and relationships between them. While this was beyond the scope of this piece of work, it is hoped that this initial development of an actor map in Great Britain will provide a foundation for the promotion of future research.

Figure 3.2: Actor map of the ‘young driver road safety system’ in Great Britain

	UK Government	National Assembly for Wales	Scottish Government	Department for Transport	Other UK Government departments (e.g. health, education, justice, treasury)	Ministers, advisers and legislators	Political parties and lobbyists
1. Government policy							
2. Regulatory bodies and associations	Licensing and standards agencies (e.g. DVLA and DVSA)	Highways England	Transport Scotland	Transport for London	Vehicle manufacturers and industry associations	Insurance industry	Emergency services
3. Proximal authorities	Local authorities	Educational institutions	Employers	Road safety agencies and charities	Driver instructor associations	Motoring organisations	Research organisations and boards
	Parents and guardians	Driver instructor association					
4. Other influences	Other family	Peers	Media and social media	Driving instructors	Commercial interventions (e.g. off-road training)	Youth organisations	Alcohol and entertainment industry
	Sporting clubs	Community groups	Religious institutions				
5. Immediate actors	Young drivers	Young passengers	Other passengers	Other road users			
6. Environment and equipment	Vehicles	Vehicle safety technology	Driver aids	Mobile device technology	Alternative transport options	Infrastructure (e.g. safe systems design)	

Source: Authors' own

4. How to Mitigate the Risk



Following evolution of the shift in focus from ‘the problem young driver’ to ‘the young driver problem’, the challenge now is to make a further shift: to reframe the focus to the ‘young driver road safety system’. Applying a systems-based approach to broaden our perspective on how to improve young driver safety might seem daunting. However, taking such an approach widens the scope for prevention efforts and provides the insights needed to place the role of education, training and licensing in perspective.

No single education or training initiative in isolation will or should be expected to be the definitive answer to solving this problem, no matter how well intentioned, developed or executed. Likewise, tougher licensing tests to ensure good standards prior to independent driving can only tackle certain aspects of one part of the overall system. While setting a benchmark for how young people should drive when first licensed, they cannot determine how young people will in fact drive once no longer under supervision, when the potential influences on driving and behavioural choices widen. Even the best-practice licensing initiatives that offer a protected driving environment in which to gain the independent experience that is needed for reducing crash risk depend on societal support – not only among young drivers, but also from their parents and the wider community. It is here that education and enforcement can support the system to increase compliance and effectiveness.

Views of young drivers and parents

Contrary to common perceptions, many parents and young people themselves are supportive of driving restrictions, especially once they have been put in place and have been found to limit intended driving only rarely. For examples, see Gill et al. (2013), McKay et al. (2008), Senserrick & Whelan (2003).

The next question, then, is what the first step should be. Further progress can be made to map actors, and the relationships between them, in the Great Britain young driver road safety system and to promote interaction and change accordingly. This will take time, and changes will probably occur during this process. Therefore, this can be seen as a continuous process with long-term objectives. In the shorter term, more immediate impacts can be made by focusing on shifts that are needed within the infrastructure currently in place with existing young driver initiatives.

Driver education and training is at the core of young driver safety initiatives in Great Britain, with widespread reach and support among many, including young people and parents. There is no reason why education and training should not form important components of the young driver road safety system in Great Britain, but the core of the system should be based on existing evidence as to what is known to work. Therefore there is a need to nudge, so to speak, the focus of young-driver-centric education and training efforts towards evidence-based content. This encompasses the need to widen the target audience and do more to educate parents, schools and the wider community, including road safety practitioners and policymakers, to view road safety from a systems perspective. If all actors could recognise and take responsibility for the roles they play in improving road safety then the benefits would improve safety for young novice drivers, as well as all road users.

4.1 Broadening and refocusing young driver education and training

Generally speaking, young people know about key road safety risks for drivers – they are well aware that alcohol and other drugs, speeding and distractions will increase crash risk and that seatbelt non-use will increase the severity of injury, ultimately risking death, in the event of a crash. Providing greater details about such factors, hearing from crash survivors or emergency responders, for example, might increase specific knowledge or awareness of these topics at the time of teaching, but the reality is that such approaches are not associated with any lasting behaviour change (Mayhew et al., 2014). This might be for a range of reasons, including the well-known human phenomena of the ‘intention-behaviour gap’ (for more about this and other factors, see Fylan, 2017). The dominant approach of such educational initiatives is to focus on young people as novice drivers, yet the same young people are also pedestrians, perhaps also cyclists, and most likely passengers – including of other young novice drivers. That is, young people have multiple road user profiles. Moreover, as noted earlier, the majority of fatalities in young-driver collisions are other road users, particularly young passengers, as well as pedestrians, cyclists and

motorcyclists (DfT, 2016). Consideration of young drivers within a sociotechnical system will need to remain open and considerate of the risk young people face as road users, not merely the risk they face as drivers. It might be necessary, for example, to consider a systems-based approach to the young road user, rather than to the young driver.

Gaps in beliefs versus behaviours

Examples of matches and mismatches between driver beliefs and behaviours can be seen in an annual, nationally representative survey in the United States. For example, in the 2016 survey only 6% of 16–18 year-olds rated typing texts or emails while driving as acceptable, yet 44% reported having done so at least once in the past 30 days. See the full report for other examples and for comparisons with other age groups (AAA Foundation for Traffic Safety, 2017).

4.1.1 Broader framing of youth education initiatives

First, considering young-driver-centric education, recent research suggests that better safety outcomes can be achieved by initiatives that shift from a narrow focus on knowledge, awareness, intentions and/or attitudes, to a broader practical focus on how to avoid or manage risks more generally (Griffin et al., 2004; Senserrick et al., 2009). This approach, known as resilience education, takes a youth empowerment approach and focuses on building strengths and competencies, encouraging youth to self-reflect on their particular tendencies, strengths and weaknesses, and in that context, to develop strategies that could work for them when faced with risky circumstances; it aims to impart skills to help them manage and bounce back from adversity. This is in the context of this stage of adolescent development, one that presents particular challenges in making safety-commensurate decisions when time-pressured, particularly in newly encountered contexts. Adolescents tend to be more reactive (physiologically and psychologically) to stress, which has long been known to impair their decision-making more than that of adults in comparably stressful situations (Johnson & Jones, 2011). Advanced consideration of acceptable, pragmatic strategies helps these solutions to readily come to mind when confronted with such situations.

Such strategies could include having code words, or pre-prepared face-saving excuses, agreed with friends or families and ready for the young person to provide when confronted with a risk-taking opportunity (e.g. “My dog is sick and I have to go home.”) This might include blaming a sudden phone call from parents informing them of this, whereas in reality they have called their parents asking them to drive so that they can escape the unfortunate choice between walking home late at night and being a passenger of a friend who has been drinking. Other strategies include forward planning to avoid being in a risk-tempting situation, such as applying time management strategies, which in driving contexts could help avoid being tempted to speed or drive when tired, for example. Resilience education typically also includes the perspective of looking out for friends, which thereby promotes safety-oriented social norms, such as the “friends don’t let friends” initiatives stemming from the early “friends don’t let friends drive drunk” campaign in the United States and since then applied with respect to other risks, such as illicit drug use and depression (Egbert et al., 2014; Glascoff et al., 2013).

An example of one such successful resilience-focused programme, which was actually more generally focused on alcohol and other drug misuse, was implemented and evaluated in United States high schools (Griffin et al., 2004). Applying a randomised control trial design, it was found that by the end of high school, students who had participated in the programme (potentially over three years) had fewer demerit points on their driving licence than those who had not. A large observational study in Australia also reported promising findings following a broad resilience education programme that included a specific focus on driving-related risks (Senserrick et al., 2009). Students participating in the programme had fewer crashes than those who did not, for up to three years following the programme. More recently, a series of studies evaluated a more-specific social resilience education programme comprising cognitive training and strategies to address social pressures and reassess potential misperceptions, with a focus on road hostility (Gidron et al., 2015). Three studies involving young adults in Belgium and Israel associated the programme with significant reductions in self-reported indirect (according to the perceptions of others) and direct (based on one's own perceptions) road hostility, as well as a reduction in crashes in a driving simulator. Overall, these studies suggest that a focus on resilience and strategies to manage risk generally, but encompassing road safety-specific risks in particular, can play a positive role in increasing youth road safety, including that of young novice drivers.

Youth development and resilience

Johnson and Jones (2011) provide a review of key developments that occur during adolescence, including recent insights from brain development research, as well as some of their implications for driving. Some further details on resilience education for young drivers are discussed in Senserrick (2016).

4.1.2 Alignment of driver education with exemplar licensing initiatives

While resilience education shows promise, it is still a relatively new approach in road safety and therefore lacking in repetition of outcomes with multiple samples in multiple contexts. The reverse is true of GDL initiatives, with decades of research in multiple countries and jurisdictions confirming significant reductions in youth crashes, fatalities and serious injuries. From this perspective, GDL has strong validity and reliability – that is, one can claim with certainty that it works. Therefore, it could be argued that this should be the core of any young driver road safety system.

The reality is, however, that the term 'graduated driver licensing' does not refer to a single initiative only. As a staged licensing system, it brings together many components that interact with each other. Often changes to licensing regulations result in multiple components being introduced at the same time, and it is rare to find any two licensing models with identical components, or with only one isolated difference, such that comparisons could be made. This means that quantifying the impact of a single component is not always possible, and the combination of components that might work best in any given jurisdiction might vary. Predicting the effectiveness of introducing a new system in a given jurisdiction might depend on a variety of factors ranging from detailed analysis of road crash and injury data to community forums and enforcement initiatives aimed at maximising

understanding and compliance. That said, several attempts have been made to determine the relative contribution of different components to the success of GDL, which provide insights into the most promising components for any jurisdiction (Kinnear et al., 2014; Senserrick & Williams, 2015). These, therefore, offer not only avenues to strengthen licensing models in Great Britain but also additional content to address in young driver education initiatives – how best to manage the driver licensing experience, irrespective of whether particular aspects are mandated for licensure.

Licensing initiatives which are considered to be important components of any optimal licensing process include those applying to the learner period, early licensure period or both. A starting point for educational initiatives includes a need to shift perceptions of the licence as the endpoint objective of the learner period and of involvement of parents and regulators. Rather, the ultimate objective is to prepare a young novice to be safer once they start independent licensed driving, with continued involvement and monitoring by parents and regulators remaining important.

What licensing initiatives have the best safety outcomes?

Because every jurisdiction and licensing system differs in important ways, quantifying the impact of particular initiatives can be somewhat artificial. As a guide, the following outcomes (Section 4.2) were the strongest associations identified in GDL evaluations as reviewed by Senserrick and Williams (2015) when tasked with this challenge.

4.2 Effective licensing initiatives

4.2.1 Pre-test experience

There is strong and consistent evidence that a minimum learner period of 12 months is protective of later crash risk (Mayhew et al., 2014; Senserrick & Williams, 2015). How best to structure practice driving during this period, or quantifying the optimal number of hours or miles of driving practice that should be achieved is less easy to discern, but some indicative research has been carried out. Certainly having as many and varied opportunities for practice with family and other informal supervisors as possible has been identified as important, particularly research in Great Britain (Groeger & Brady, 2004). Such practice driving provides important variation in trip lengths and locations with respect to (amongst other variables) speed zones, traffic and weather conditions and times of day, most particularly including night driving, in contrast to professional lessons, which are typically of the same duration and at similar times of day. On the other hand, professional lessons can be important for identifying and correcting poor techniques and ensuring that learners face complex driving conditions (Tronsmoen, 2011). Therefore, a combination of some professional lessons with many hours of practice driving is a good target. A target over 100 hours is generally recommended, with Australian research finding that it is not until such a high amount is achieved that learners start to practise in more complex driving conditions (Cavallo & Oh, 2008).

In terms of more-specific training relative to licensing, in-vehicle instruction at this time is associated with high success in passing the practical test, but this has not historically been associated with increased safety once licensed (Senserrick & Williams, 2015). As noted above, advanced vehicle skills training has likewise failed to increase safety post-test, sometimes even proving counterproductive. Research suggests that the most promising training at this time is hazard perception training, also known as hazard anticipation training. There is clear evidence that hazard perception skills are more developed for experienced drivers when compared to novice drivers, and that poor skills are related to historical collision involvement (Hull & Christie, 1993; McKenna & Horswill, 1999; Quimby et al., 1986; Wells et al., 2008). There is also evidence that training does improve hazard perception skills, and this includes real-world on-road studies (McDonald et al., 2015; Pradhan et al., 2009). However, research has yet to explore the relationship between trained increases in hazard perception skills and a reduction in collisions, to confirm the safety benefits (McDonald et al., 2015). Nevertheless, the introduction of the hazard perception test in the licensing process in Great Britain has been associated with a reduction of 11.1% in non-low speed on-road accidents (Wells et al., 2008); continuation and enhancement of this remains the best training option at this stage.

Licensing and educational initiatives should aim for young people to achieve at least 12 months as a learner driver, with clear messaging and support to encourage use of this time to achieve a high level of driving experience, with hazard perception training likely to be the best supporting initiative. Educational initiatives could include simple strategies for achieving the target of over 100 hours with undue burden; for example, sketching out on calendars routine trips such as to school, sports, shops and social engagements when the learner can drive, in addition to specific trips in order to increase hours. Once a learner has achieved the basics of handling a car and manoeuvring in traffic (and when supervisors therefore feel more relaxed), then complexity can be incrementally increased. Professional instructors can also assist with planning more structured experiences. Ultimately, the learner should be driving comfortably in the types of situations in which they will drive on their own once licensed.

4.2.2 Post-test risk management

The licensing initiatives associated with the largest reductions by far in casualty crash risk relate to specific measures in the first six to twelve months of independent licensure, particularly restrictions on night driving and limits on peer passengers. These restrictions do not equate to curfews from such driving – rather, continued supervision is required and encouraged in these circumstances so that the learning process continues. This likewise is encouraged when young novices face circumstances not previously encountered, such as inner-city or remote area driving, or extremes in weather (notably with a 12-month learner period also aiming for learners to have experienced driving in all seasons).

Also important is a zero-alcohol restriction for both learners and newly licensed drivers, so that there is separation of alcohol and driving rather than attempts to try to manage alcohol levels. Moreover, research in New Zealand has quantified the increased risk that alcohol poses for the young inexperienced driver: the risk of a fatal crash doubled for every 0.02%

(200 mg/dl) increment in blood alcohol concentration (BAC), with a 0.02% BAC for the young inexperienced driver presenting five times the fatal crash risk of an experienced driver with the same BAC (Keall et al., 2001, 2004). These risks were found to inflate even further at night and with each additional passenger. With a legal BAC limit of 0.08% in England and Wales, it is noteworthy that 13% of their 16–19-year-old drivers/riders killed in 2015 had a BAC in the range 0.01–0.08% (DfT, 2016).

Education for young people to understand that their level of inexperience and stage of development contribute to these risks might be important for them to recognise that these risks apply to all of them – not only those who drive recklessly or aggressively. Crash risk is highest at night for *all* drivers, but greater for young inexperienced drivers, whose crash risk also increases incrementally with each additional peer passenger (Williams, 2003). Adolescent development also brings a shift in the onset of deep sleep to much later at night (c. 11 p.m.); the need for sleep is stable (or increases) across adolescent development (Carskadon, 2011). A worldwide review demonstrates how average weekday sleep durations fall significantly lower than this (Gradisar et al., 2011), meaning that young drivers are particularly susceptible to fatigue, not only at night but also during early mornings and late afternoons, which are the peak commuting periods for many. While the role of fatigue in crashes can be difficult to isolate, the UK *THINK!* Campaign suggests that sleep problems contribute to as much as 20% of crashes on major roads, with young men aged under 30 having the greatest risk of falling asleep at the wheel (DfT, 2012).

Therefore, strategies to manage sleep needs and minimise driving at night, with multiple peer passengers and with even small levels of alcohol are of critical importance. While a zero limit can appear harsh given the chance for trace alcohol (from food, for example), police can apply tolerance in enforcement, in a similar manner to the way in which speeding offences are treated. Examples of approaches to manage these risks can be seen in regulatory licensing initiatives in North America and Australasia. Such approaches have demonstrated significant reductions in collisions, particularly where the regulation has been supported at all levels of the system (e.g. by government, enforcement authorities, parents and young drivers). Another innovation from a lower level of the system, that has improved educational as well as road safety outcomes, has been to delay school start times for high school students to account for their changing sleep patterns (see review by Owens, 2014).

Other lower-level system initiatives are those to improve the crashworthiness of the vehicles in which young novices drive. Often these are older or smaller vehicles, or models that for other reasons lack the recent advances in occupant protection (see for example Keall & Newstead, 2011; Watson et al., 2009; Whelan et al., 2009). Initiatives to help young people and parents identify and select safer cars, quite feasibly from within a similar price bracket, for example by use of information available online (www.euroncap.com and howsafeisyourcar.com.au), can lead a safer choice of vehicle.

5. Discussion



Young drivers are over-represented in crashes, primarily because they are novices at an extremely complex task with multiple influencing factors, including age-related influences that make up an important part of human development. All new drivers (whatever their age) are at increased risk of a crash when first starting to drive independently, and this is also the largest contributor to young drivers' inflated crash risk. Age-related neurobiological influences that further inflate this risk for young drivers (aged between 17 and 24) include the well-recognised heightening of sensation-seeking and peer influences, but also the less well-recognised heightened vulnerability to distractions and fatigue. Traditional approaches to reducing young-driver crashes generally fail to take these critical factors into account, and therefore have largely failed to reduce young-driver-related road trauma. It can also be said that too much has been expected of interventions that are required to supplement the current process to produce new drivers in Great Britain.

Adopting a 'systems-based' approach provides a new perspective regarding how current interventions can be revised and used to support and effectively contribute to a 'young driver road safety system'. Current countermeasures

in Great Britain are largely ‘young-driver-centric’ – this description applies (amongst others) to measures targeting knowledge of the rules of the road, basic vehicle-handling skills, intentional risk-taking behaviour and licence testing. These may well all have a role in contributing to the system, but will not individually – or collectively – lead to significant reductions in young-driver-related road trauma, which is the ultimate aim. By taking a systems-based approach, these traditional initiatives can be freed from the burden of an expectation that they should directly improve safety, and more realistic objectives to support the system can be set. However, the core of the young driver road safety system should be based on initiatives that have a clear evidence base.

The strongest evidence base for preventing young-driver crashes is found in licensing initiatives which seek to mitigate young drivers’ exposure to crash risk. These particularly include an extended period of learning, with depth and breadth of supervised driving experience and, once licensed, initiatives to limit exposure to the high-risk conditions of driving late at night, with multiple peer passengers and under the influence of alcohol. Several examples have been proposed of how to best reframe current education and training to support these initiatives, including the adoption of a broad resilience-focused approach.

An initial undertaking to map key actors in the Great Britain’s young driver road safety system provides a starting point in the task of illustrating those who influence the system in Great Britain. Further effort is required to identify additional actors, responsibilities and relationships, and to engage these actors in optimising efforts to improve youth road safety. Research to date suggests that a shift in focus of attention towards the higher levels of the system is necessary if the information flowing upwards from the traditional research focus on the lower levels (i.e. understanding how and why young drivers crash) is to be used most effectively. Where higher-level interventions have been implemented, these have led to the greatest improvements in young driver road safety.

5.1 Other considerations

Ongoing evaluation of these efforts to identify and enhance Great Britain’s young driver road safety system will be important in determining what is working best and what is not working, so that efforts can be made to optimise the system. The importance of evaluation cannot be understated, because without an evidence base many efforts will be futile and some even risk yielding counterproductive outcomes. There may well be important contributors that are already in place now, but which are unrecognised due to a lack of evaluation of their impact. This includes many well-intentioned community-based programmes that happen at the grass-roots level. The RAC Foundation community guide to behavioural change techniques offers practical advice in this respect (Fylan, 2017).

From another perspective, however, there are examples of very well developed programmes that are based on the best available evidence of the time, but which prove very difficult to upscale and roll out. A recent example includes a coaching programme developed for novice motorcycle riders in Australia (Ivers et al., 2016; Russell et al., 2015). While

the programme was well-informed, it proved difficult to roll out during the trial evaluation. Instructors required several days of training, and the voluntary participant uptake, scheduling difficulties and other factors all led to protracted delays in the trial schedule, which contributed to a high turnover of programme instructors (Russell et al., 2015). The programme outcome evaluation failed to identify a safety benefit in terms of crash reductions (Ivers et al., 2016), but questions remain as to whether this was due to the quality of the course as developed, or to deficiencies in the ability to deliver the course optimally within the trial conditions. Both of these factors are important to determine. Likewise, such findings again raise the question as to whether road casualty reductions are a reasonable expected outcome of one-time interventions evaluated in the short term. It can be argued that, if real change is to occur, the likelihood of being able to implement an initiative on a wide scale is as important as the quality of its content, no matter how well it might perform in a smaller scale trial.

A related example of challenges in implementation in the field of young drivers can be found in relation to in-vehicle monitoring and alerting technologies. These systems have been shown to improve driving behaviours related to safety (e.g. speeding), particularly when under parental monitoring, but it has proved difficult to get parents to take them up, or to undertake the actual monitoring required (McCartt et al., 2010; McGehee et al., 2007). Likewise, parent-teen agreements regarding staged licensing initiatives have also shown promise in improving behavioural outcomes and reducing crashes for young drivers, but these, too, have proved difficult to roll out on a voluntary basis, with the result that the potential for wide-scale uptake and positive outcomes are somewhat inconclusive (Curry et al., 2015; Shope et al., 2016).

It is also important to implement policies that are well understood and enforceable to ensure high compliance and therefore high efficacy, as has been achieved with graduated driver licensing (GDL) in other countries. The Australian approach has been to issue public discussion papers and set up widespread community forums regarding proposed enhancements to licensing and other practical supporting initiatives; these have been associated with high acceptance and uptake (VicRoads, 2005). One example of such supporting initiatives is the distribution of voluntary logbooks and 'scratch cards' in Victoria to promote the recording of 120 hours of supervised practice driving prior to licensure in the years leading up to the introduction of that policy. Subsequent evaluation found that learners at the minimum age of 16 years were already averaging over 120 hours prior to the policy introduction (Healy et al., 2012). It is of note that Victoria also subsequently introduced a co-ordinated system of support programmes, known as 'learner driver mentoring programmes', to help youth without access to appropriate supervisory drivers or vehicles to nevertheless achieve 120 hours of practice (Freethy, 2012). Establishing such programmes prior to introducing new policies provides further support for their efficacy and helps to ensure that access to licensure is not compromised for youth who may be at a disadvantage. Such examples demonstrate the use of resources and agencies at various levels of the system to promote and support the implementation of an approach to improve safety (in this case increased supervised on-road practice).

5.2 Future directions and recommendations

Ultimately, there are many layers in any defined young driver safety system, but working collectively can achieve significant improvements in road safety for youth and young adults, as well as for the road user community more broadly. The following key recommendations are offered for future directions.

First, it is important to note continued need to identify key actors, responsibilities and relationships in Great Britain's young driver road safety system and to promote improved interactions across and between the multiple levels, particularly higher levels. The current model is offered as a preliminary example to generate further efforts.

Further, there is a need to reframe youth road safety education and training efforts to focus on developmental and inexperience factors that are known to contribute to young novice-driver crashes – more generally, include resilience education, and more specifically, this should be a consideration in how best to manage the licensing process. This includes a focus on strategies which manage risks, including the minimising of distractions, strategies for managing time and fatigue, and hazard perception training.

Educational initiatives should also be used to support evidence-based risk-mitigating licensing initiatives – specifically, a 12-month learner period, promoting over 100 hours of supervised practice driving pre-test; and post-test restrictions on unsupervised night-time driving, the carrying of multiple peer passengers and any consumption of alcohol when driving.

Widening these education efforts to include parents, road safety practitioners and policymakers, and the wider community is also important. There is a need to increase understanding of these youth initiatives and the place that they have within the young driver road safety system, as well as to promote recognition of and improvements to their own contributory roles.

Ensuring that initiatives are well planned and well evaluated (both the process and the outcomes) on an ongoing basis is essential in order to ensure the efficacy and effectiveness of efforts. Resourcing for evidence-based initiatives can then be – and should be – prioritised over approaches that are known to fail to demonstrate benefits.

Collective efforts, in which lower levels of the system support higher-level strategy with consistent messaging, encouraging all actors to co-ordinate and collaborate, offer the greatest opportunity to significantly improve young-driver-related road safety outcomes in the future.

While the focus here has been on Great Britain, it is also of note that the same recommendations are considered to apply to other countries and jurisdictions. This is due to the pervasive role, regardless of country and culture, of driving inexperience and adolescent developmental factors in youth road trauma at the individual level, and the need to apply systems-based thinking if the wider spectrum of contributory factors at a jurisdictional level is to be truly addressed. The scope of this includes locations where GDL is already in place, given that the implementation of GDL alone is not a panacea

for all young and novice-driver ills. As more young driver road safety systems emerge, and the evaluation of their potential reach and impact becomes possible over time, more opportunities for reciprocal learning and successes in the future will arise.

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