

# CONTRACT REPORT

## 'Driver Headspace': Understanding the Impact on Driver Psycho-physiological Functioning of Exposure to Stressful Events and Adverse Circumstances



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by Mitchell Cunningham, Michael A. Regan

for National Road Safety Partnership Program  
(NRSPP)

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Reviewed	
Project Leader	 Prof. Michael Regan
Quality Manager	 Jerome Carslake

**ARRB Group Ltd**  
ABN 68 004 620 651

**Victoria**  
500 Burwood Highway  
Vermont South VIC 3133  
Australia  
P: +61 3 9881 1555  
F: +61 3 9887 8104  
info@arrb.com.au

**Western Australia**  
191 Carr Place  
Leederville WA 6007  
Australia  
P: +61 8 9227 3000  
F: +61 8 9227 3030  
arrb.wa@arrb.com.au

**New South Wales**  
2-14 Mountain St  
Ultimo NSW 2007  
Australia  
P: +61 2 9282 4444  
F: +61 2 9280 4430  
arrb.nsw@arrb.com.au

**Queensland**  
123 Sandgate Road  
Albion QLD 4010  
Australia  
P: +61 7 3260 3500  
F: +61 7 3862 4699  
arrb.qld@arrb.com.au

**South Australia**  
Level 5, City Central,  
Suite 507, 147 Pirie Street  
Adelaide SA 5000  
Australia  
P: +61 8 7200 2659  
F: +61 8 8223 7406  
arrb.sa@arrb.com.au

**International office**  
770 Pennsylvania Drive  
Suite 112  
Exton, PA 19341  
USA  
Tel: 610-321-8302  
Fax: 610-458-2467

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# **'DRIVER HEADSPACE': UNDERSTANDING THE IMPACT ON DRIVER PSYCHO-PHYSIOLOGICAL FUNCTIONING OF EXPOSURE TO STRESSFUL EVENTS AND ADVERSE CIRCUMSTANCES**

# EXECUTIVE SUMMARY



## Introduction

The term 'driver headspace' has been used by some organisations to refer to the state of mind, or mindset, of a driver as a result of exposure to a stressful event or adverse circumstance.

The National Road Safety Partnership Program (NRSPP) Driver Headspace Working Group approached ARRB Group to carry out research to define, shed light on, and increase understanding of the term 'driver headspace', and events that impact on it. As per their initial Project Brief, the research had seven aims; to:

1. identify and categorise sources of driver headspace events
2. understand the prevalence of driver headspace events across different sectors
3. understand the mechanisms by which driver headspace is negatively impacted
4. understand individual differences in the ability to experience and endure driver headspace events
5. understand strategies that drivers do, and could, use to deal with driver headspace events
6. understand the impact of driver headspace events on driver behaviour and performance
7. identify strategies and organisational policies for preventing and mitigating the effects of driver exposure to driver headspace events.

A review of the literature, described below, revealed no scientific reference to, or definition of, the term 'driver headspace'; or to changes in driver headspace, per se, resulting from driver exposure to a stressful event or adverse circumstance. What the literature did reveal, however, is that exposure to a stressful event or adverse circumstance may have negative impacts on psycho-physiological functioning and, in turn, on driver performance and safety. Thus, for the purposes of this study, stressful events or adverse circumstances that may have a negative impact on a driver's psycho-physiological functioning are referred to as 'driver headspace events'. 'Driver Headspace' thus refers to the state of a driver's psycho-physiological functioning as a result of exposure to a stressful event or adverse circumstance.

## Method

Information and data to address these research aims were derived from four primary research activities:

- a literature review
- a focus group
- a workshop at the 4<sup>th</sup> International Conference on Driver Distraction and Inattention (2015)
- an online survey.

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## **Findings**

- Driver headspace events can derive from a myriad of negative and stressful events/circumstances and can be categorised based on whether they occur within or outside the workplace, and on whether they are traumatic or non-traumatic in nature.
- There is a high prevalence of driver headspace events across different professional driving work positions due to multiple work-related stressors and increased prevalence of mental health issues. A significant proportion of participants (from the online survey) noted having experienced driver headspace events previously.
- Mechanisms that may underlie the impact of stressful events and adverse circumstances on driver psycho-physiological functioning include cognitive distraction, mental fatigue, and physiological changes due to the human stress response.
- The impact of stressful events and adverse circumstances on driver psycho-physiological functioning will likely vary according to a number of individual differences, including one's personality traits and one's level of social support.
- When affected by a driver headspace event, drivers may use a number of strategies to deal with the potential impairments in driving ability it may lead to. Drivers typically: (a) may attempt to deal with the stressful circumstances themselves through a number of different coping strategies, (b) may rely on mindfulness techniques to reduce the human stress response, or (c) seek psychological help from employee assistance programs.
- A number of studies suggest that indices of 'life stress' (e.g. financial stress, marital troubles) are associated with reduced driving safety (e.g. increased accident risk). Mental health issues, which can follow from prolonged exposure to stressful and adverse circumstances, have also been shown to be associated with driving decrements and increased crash risk.
- In general, six strategies are offered to reduce the prevalence of stressful circumstances and help mitigate mental health issues (and, in turn, driver headspace events) within the workplace:
  - designing and managing work to minimise harm
  - promoting protective factors at an organisational level to maximise resilience
  - enhancing personal resilience
  - promoting and facilitating early help-seeking
  - supporting worker recovery from mental illness
  - increasing awareness of mental illness and reducing stigma.

## **Conclusion**

The research undertaken in this study reveals that degraded psycho-physiological functioning brought about by exposure to a stressful event or adverse circumstance is a real issue that has not received the empirical attention that it warrants. Further research is needed to gain a more in-depth understanding of the actual prevalence of 'headspace events' and their consequences.

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# 1 INTRODUCTION

Everyone experiences stress at one time or another (Troy & Mauss 2011). However, the impact of stressful events and negative affective states on driving performance has received very little attention in the road safety literature. This is surprising given that individuals, through their day-to-day activities, are exposed to a variety of distressing events that may be brought into the vehicle. These events may be work-related, flow on from personal issues, or derive from other external factors. Such events may have a negative impact on what has been coined colloquially by some organisations as 'driver headspace'. Workers (this encapsulates both workers and volunteers) that undertake driving-related work (e.g. bus or truck drivers) may be at an increased risk of being impacted by this issue.

The National Road Safety Partnership Program (NRSP) Driver Headspace Working Group approached ARRB Group to carry out research to define, shed light on, and increase understanding of the term 'driver headspace'. As per their initial Project Brief, the research has seven research aims; to:

1. identify and categorise sources of driver headspace events
2. understand the prevalence of driver headspace events across different sectors
3. understand the mechanisms by which driver headspace is negatively impacted
4. understand individual differences in the ability to experience and endure driver headspace events
5. understand strategies that drivers do, and could, use to deal with driver headspace events
6. understand the impact of driver headspace events on driver behaviour and performance
7. identify strategies and organisational policies for preventing and mitigating the effects of driver exposure to driver headspace events.

Information and data to address these research aims were derived from four primary research activities:

- a literature review to determine what literature exists relevant to the driver headspace issue
- a focus group to gain a first-hand account of the driver headspace issue across a number of different organisations
- a workshop at the 4<sup>th</sup> International Conference on Driver Distraction and Inattention (DDI 2015) held in Sydney, Australia
- an online survey to obtain information regarding the driver headspace issue from a wider audience and a variety of driving-related work positions.

The focus group and online survey were designed in accordance with, and peer-reviewed by, a member of the University of New South Wales Human Research Ethics Advisory Panel (HREA Panel H).

This document is divided into five main sections:

1. Information gleaned from the literature review.
2. Information gleaned from the focus group.
3. Information gleaned from the DDI 2015 Conference workshop.

4. Information gleaned from the online survey.
5. Conclusions.

## 2 LITERATURE REVIEW

### 2.1 Method

The first part of this study involved a literature review to explore the driver headspace issue in relation to driving safety. Due to the understudied nature of the topic, the authors (in agreement with members of the NRSP Driver Headspace Working Group) decided on a series of aims to guide the literature review (see Section 1).

The literature review involved the following activities:

1. A peer-review literature search using a variety of reference databases. These included those accessible through the M.G. Lay Library, located at ARRB in Melbourne, and university databases accessible to the authors.
2. General Google searches which were used to obtain relevant non peer-reviewed monographs and sources (e.g. 'grey' literature) and industry-related research reports.
3. Key search terms that were directly related to the seven research aims listed in Section 1 were used. For example, key search terms for research aim 1 (i.e. *sources of driver headspace*) included 'headspace', 'stress', 'fatigue', 'rumination', 'worry', 'mindset', and 'trauma'. Boolean terms were used to connect these search terms with aspects of driving performance and safety, such as 'drive', 'driving safety' and 'driving performance'.
4. An ancestry approach was used to obtain other relevant documents; that is, using references within the literature obtained to lead the authors to other relevant documents.
5. Relevant literature and documents were selected for review.
6. The literature was reviewed to draw out key information that was relevant and helped us address the seven research aims listed above.
7. The authors consulted with members of the NRSP Driver Headspace Working Group to uncover any literature or research not discovered during the prior steps.

### 2.2 Sources of Driver Headspace Events

'Driver headspace' is an abstract concept that has been coined by some organisations to describe changes in a driver's state of mind, or mindset, resulting from exposure to a stressful event or adverse circumstances.

Review of the literature undertaken in this study reveals no scientific reference to, or definition of, the term 'driver headspace'; or to changes in driver headspace, per se, resulting from driver exposure to a stressful event or adverse circumstance. What the literature does reveal, however, is that exposure to a stressful event or adverse circumstance may have negative impacts on psycho-physiological functioning and, in turn, on driver performance and safety. Thus, for the purposes of this study, stressful events or adverse circumstances that may have a negative impact on a driver's psycho-physiological functioning will be referred to as 'driver headspace events'. 'Driver headspace' will thus refer to the state of a driver's psycho-physiological functioning as a result of exposure to a stressful event or adverse circumstance.

In general, driver headspace events may be categorised based on whether they occur within or outside a driver's workplace.

### **2.2.1 Driver Headspace Events Within the Workplace**

#### *Traumatic (extreme stress) events*

While every workplace may be at risk of traumatic and unexpected events, there are several professions that have a predictable and foreseeable risk of being exposed to traumatic (e.g. extremely distressing) situations. Such professions noted in the literature include those in emergency services, the military, acute medical services, bank offices, as well as occupations such as train drivers (McFarlane & Bryant 2007). Examples of traumatic events that may be experienced by people in such professions include mass disasters, serious accidents, threat of death and injury, witnessing death or injury, and assault (McFarlane & Bryant 2007). Individuals exposed to such events may be traumatised, which is defined as 'the experience of lasting shock as a result of a disturbing experience' (Oxford Dictionary 2016). For a driver (e.g. paramedic), the acute stress and negative emotional reactions experienced following a traumatic event may have an impact on driver headspace. The potential underlying mechanisms by which traumatic events may impact on driver headspace will be discussed in Section 2.4.

#### *Non-traumatic events*

Driver headspace events within the workplace can be more chronic (as opposed to traumatic or acute) in nature. For example, McFarlane and Bryant (2007) suggest that workers across a diversity of work positions, both driving-related and non-driving-related, can be exposed to a wide range of negative and adverse circumstances that may impact on the individual's headspace, such as:

- poor supervisor relations
- interpersonal conflicts
- high workload and time pressures
- shift work and long hours
- low job satisfaction.

A comprehensive list of common work-related stressors (and therefore potential driver headspace events) for both professional drivers and emergency service workers can be found in Appendix A.

### **2.2.2 Driver Headspace Events Outside the Workplace**

A driver's headspace may also be impacted by events, situations and circumstances that derive from outside the workplace. Some notable examples include:

- financial difficulties
- marriage separation or divorce
- illness, injury or death of a loved one.

Such stressful and negative life events may 'spill over' to, and potentially disrupt, other parts of the individual's life, such as their driving (e.g. worrying about financial difficulties while driving to and from work).

It is well-cited that stressful and negative life events often precede the development of mental health issues such as depression and anxiety, which can further exacerbate impaired driving (see Section 2.7.2).

## 2.3 Prevalence of Driver Headspace Events

To gain an idea and understanding of the prevalence of driver headspace events across different professions, it is reasonable to examine the different levels of exposure to stressors and other potentially adverse events across these work positions. In other words, it is logical to assume that an estimate of the prevalence of headspace events in a specific work position will correlate with the level of exposure to stressful situations, events and other circumstances that a worker may face.

In addition, although all types of work positions and workplaces can have their respective stressors and negative circumstances, for the purposes of this research, special attention will be paid to individuals for whom driving plays an integral role in their work. This is crucial, as these individuals may be at the highest risk of being negatively affected by driver headspace events, simply because they drive the most.

In light of this, the literature review focused on the prevalence of driver headspace events for professional drivers (i.e. long-haul drivers and bus drivers) and emergency service workers.

### 2.3.1 Professional Driving Work Positions

As noted before, it is important to look at the prevalence of potential driver headspace events across sectors and work positions where driving plays a major and integral part. In general, professional drivers can be exposed to a myriad of workplace stressors and negative circumstances that may impact on their headspace, such as the behaviour of other drivers, traffic congestion, ergonomic factors (e.g. position of steering wheel, cabin temperature), noise, climate conditions, and work scheduling — resulting in poorer health and work performance (Evans, Johansson & Rydstedt 1999).

#### *Bus drivers*

Previous research has shown that bus and coach drivers may be exposed to a multitude of overlapping and long-lasting stressful events during their daily work routine, which may have a negative impact on their driver headspace. Some of the more dominant stressors include alternating shift work, time pressure due to the route schedule, responsibility for passengers and vehicle, risk situations in traffic, restriction of movement and continuous vigilance (Kompier 1996). A recent qualitative study identified metropolitan bus driving as one of the more stressful work positions, and notes a lack of support from management, policing fares, interacting with aggressive passengers, poor cabin ergonomics, tight route schedules and shift irregularity as primary stressors and sources of fatigue for drivers (Biggs, Dingsdag & Stenson 2009).

Research suggests that this increased exposure to workplace stressors may be associated with an increased risk of mental health issues in bus drivers. A recent survey by the Bus Association of Victoria (2015) indicates that bus drivers are showing signs of stress and undiagnosed mental illness in higher numbers than might be expected in the general population. For example, it was found that:

- 61% experience job stress
- 45% are exposed to aggression or abuse at least weekly
- 59% lose sleep
- 57% feel irritable or frustrated
- 46% experience anxiety
- 35% experience depression

- 28% have had a diagnosed mental illness
- 12% were seeking treatment at the time of the study.

### *Long-haul drivers*

Long-haul driving is another occupation that may expose a driver to a high number of work-related stressors and therefore negatively impact driver headspace. Some notable stressors include: long work hours, disrupted sleep patterns and fatigue (Sabbagh-Ehrlich, Friedman & Richter 2005), spending many consecutive days away from home and family, and time pressures due to demands of 'just in time' delivery requirements (Heaton 2005). In addition, long-haul drivers typically have limited opportunities for social support, which can exacerbate the work-related stress experienced (Apostolopoulos et al. 2010).

As a result of prolonged exposure to such driver headspace events, it has been suggested that long-haul drivers may be at increased risk of mental health issues and psychiatric disorders. As with bus drivers, a recent study of male truck drivers by Shattell et al. (2012) suggests that such work-related stressors may be associated with a number of mental health issues, including:

- loneliness (27.9%)
- depression (26.9%)
- chronic sleep disturbances (20.6%)
- anxiety (14.5%)
- other emotional problems (13%).

A more recent study by PricewaterhouseCoopers (PwC 2014) reported on the prevalence of mental health conditions in transport, postal and warehousing industries (which hold a significant proportion of long- and short-haul drivers) and found that:

- 23.0% of workers reported a mental health condition
- 6.0% of workers reported having a substance abuse condition
- 20.4% of workers have an anxiety condition
- 7.2% of workers have a condition affecting their mood, such as depression.

It is also important to note that long-haul drivers are at an even larger disadvantage as a significant proportion do not receive medical attention when they need it, as they are either on the road or unable to find a convenient medical facility (Layne, Rogers & Randolph 2009; Solomon et al. 2004).

### **2.3.2 Emergency Service Workers**

Emergency workers (e.g. police officers, firefighters, ambulance officers, paramedics) have a predictable and foreseeable risk of exposure to threat, distress and traumatic events. These individuals have to endure such circumstances and still safely drive their respective vehicles to and from different scenes (e.g. a paramedic driving an ambulance to and from hospital), as well as potentially drive their own vehicles to and from their workplaces before and after shifts.

Due to regular exposure to such events, it is not surprising that such individuals are at an increased risk of a variety of mental health problems, including depression, acute stress disorder and post-traumatic stress disorder (O'Donnell et al. 2003). For example, a recently published systematic review and meta-regression analysis examining the results of international studies of



over 20 000 emergency service workers concluded that the prevalence of Post-Traumatic Stress Disorder (PTSD) amongst current workers was 10% (Berger et al. 2012). In addition, it has been estimated that, at any given time, 15–32% of all emergency responders are dealing with a reaction to post-traumatic stress and that there is a 30–64% chance that they will have a negative mental health reaction to this during their lifetime (Everly & Mitchell 1997).

An Australian survey of 223 police officers found that each officer experienced, on average, nearly nine critical police incidents in a 12-month period (Hodgins 2000). In addition to this, a pilot study by Queensland Police suggests that 95% of participants reported experiencing work-related trauma at some point in their career (Rallings 2000). It may, therefore, be of little surprise that police officers are at a considerably high risk of developing traumatic stress and related disorders (Robinson, Sigman & Wilson 1997; Carlier, Lamberts & Gersons 1997; Rallings 2000).

Earlier studies suggest that PTSD rates for firefighters are between 18 and 37% (Bryant & Harvey 1995; Wagner, Heinrichs & Ehler 1998; Corneil et al. 1999), a prevalence of approximately two to four times higher than community samples (Johnson, Maxwell & Galea 2009).

Although these findings and statistics are primarily concerned with the prevalence of mental health issues in the emergency services sector, they indicate the potentially high prevalence of driver headspace events and workplace stressors that these individuals may face while driving during shifts.

## **2.4 Mechanisms of Driver Headspace Events**

Determining the mechanisms by which a negative or stressful event may impact on a driver's headspace and, therefore, driving safety, is perhaps one of the more difficult tasks in this research. This is due to a number of reasons, including the subjective nature of the experience of stress, as well as the multiple ways in which stress can influence one's psychological, physiological and cognitive state. However, three primary mechanisms can be gleaned from the literature.

### **2.4.1 *Diversion of Attentional Resources Away from Driving – Cognitive Distraction***

When a driver has experienced or is experiencing a stressful or negative situation, he or she may think about it persistently, effectively distracting the driver from the driving task.

Driver distraction has been defined as:

The diversion of attention away from activities critical for safe driving toward a competing activity, which may result in insufficient, or no, attention to activities critical for safe driving. (Regan, Hallett & Gordon 2011).

To date, the primary focus of research on driver distraction has been on physical objects, events and activities, within and outside the vehicle, which divert attention away from activities critical for safe driving (see Regan, Lee and Young 2009 for a review). However, very limited research has focused on distraction deriving from within the driver's mind.

'Cognitive', or 'internal', distraction refers to distraction induced by spontaneous internal thoughts, thinking about things, and mind wandering, all of which can divert driver attention away from activities critical for safe driving (Regan, Hallett & Gordon 2011). Some individuals are especially prone to worrying about negative things in their life, ruminating about them, and replaying them over and over again in their heads. This worrying and thinking about negative or adverse circumstances (e.g. financial problems), along with task-unrelated thoughts and mind wandering, can induce attentional lapses (Carriere, Cheyne & Smilek 2008). Essentially, for a driver, these

internal processes lead to an endogenous orientation of attention away from the current primary activity (e.g. driving) to internal thoughts, making the latter the priority (Regan, Lee & Young 2009). Stated differently, the cognitive processes associated with stress (e.g. processing intrusive thoughts) use up limited attentional resources that could otherwise be directed towards the primary driving task at hand.

This switching of attention from the driving task to processing internal stimuli and thoughts can: (a) place a higher mental workload (cognitive resources being used up by processing of stressful thoughts) on the driver due to the necessity of mobilising attentional resources to process internal information (Smallwood & Schooler 2006), and (b) lead to attention being diverted away from activities critical for safe driving (Regan, Lee & Young 2009). In addition, cognitive distraction can lead to inattentive blindness and reduced situational awareness in the driver — two phenomena that can degrade activities critical for safe driving (see below).

#### *Inattentive blindness*

If a driver is experiencing stress and is cognitively distracted as a result, he/she may be more prone to inattentive blindness. Inattentive blindness occurs when an individual fails to recognise an unexpected stimulus that is in plain sight (i.e. 'looked at, but did not see'). The attentional resources utilised by the cognitive processes (i.e. distraction) reduce the resources that could otherwise be used for the detection of important road-related visual stimuli, essentially leading to poorer hazard detection and sensitivity to critical driving cues and traffic signals (Strayer, Drews & Johnston 2003; Strayer & Johnston 2001).

#### *Reduced situational awareness*

Situational awareness (SA) is defined as an operator's dynamic understanding of what is happening around them (Salmon et al. 2009). For drivers, this means maintaining awareness of the vehicle state, the road and traffic situation, as well as being kept 'within the loop' of the driving task. For this to occur, driver attention is persistently required to repeatedly update the driver's mental model of the often dynamic and complex driving environment that he/she is navigating. If a driver is cognitively distracted, their mental model will likely be incomplete (i.e. low SA), therefore requiring more attention (sometimes too much) to first update the model before an appropriate response can be generated in the case of a sudden or emergency event (e.g. a crossing pedestrian or a braking lead vehicle) (Zeeb, Buchner & Schrauf 2015).

### **2.4.2 Lack of Attentional Resources for Driving – Mental Fatigue**

An individual may become mentally fatigued if he/she experiences prolonged periods of stress without adequate time to rest and recover. Fatigue is especially relevant in the realm of driver headspace as, for example, an individual may have a demanding day at work and drive home after in a fatigued state. That is, the driver's headspace is likely to be negatively impacted by the day's demanding events, which potentially induces mental fatigue.

Mental fatigue is a temporary inability to maintain optimal cognitive performance and can arise from a number of different factors other than prolonged periods of stress (e.g. biological factors such as circadian rhythm). Fatigued individuals often report difficulties in concentrating and focusing their attention on the tasks they are required to perform, increased frequency of attentional lapses, and difficulty staying alert (van der Linden, Frese & Meijman 2003; van der Linden 2011; Meijman 1997). These cognitive impairments may be partially attributed to the demand and, therefore, depletion of attentional resources due to mental processes associated with the experience of a stressful event (e.g. worrying) (Matthews & Desmond 2002). Stated differently, in the realm of driver headspace, drivers that have experienced a prolonged period of stress



preceding driving may have negatively impacted driver headspace in the sense that they may lack sufficient resources to allocate to changing driving demands. For most people, even though driving a vehicle is a highly-automated behaviour if road and traffic demands are minimal, an individual with negatively impacted driver headspace due to mental fatigue may be impaired in detecting and responding to unexpected or sudden changes in the road environment (e.g. a pedestrian running across the road). Fatigue, more generally, is well-cited as being an important contributing factor in a high number of traffic accidents; however, a review of the fatigue literature is beyond the scope of this study.

An example of mental fatigue in the workplace may be akin to when an individual describes themselves as being 'burnt out'. Burnout is defined as a prolonged response to chronic emotional and interpersonal stressors on the job (Maslach, Schaufeli & Leiter 2001). Emotional exhaustion is thought to be the most prominent facet of burnout, characterised by feelings of emotional depletion, extreme tiredness, lack of energy, feeling of being drained of emotional resources, and a range of cognitive and attentional deficits (Maslach, Schaufeli & Leiter 2001). Due to these deficits, the issue of burnout and prolonged workplace stress is especially relevant to the driver headspace issue in both professional and non-professional drivers. For example, bus drivers, who often have multiple work-related demands to monitor over a prolonged period (shifts last up to eight hours), may suffer from burnout and mental fatigue as their shift progresses, potentially jeopardising driving performance and safety. For individuals in non-driving work positions and sectors, the burnout associated with work may spill over into their driving, such as to and from work. Workplace pressures impact on a large number of workers at some point throughout their lives, as evidenced by a number of epidemiological studies (e.g. Packham & Webster 2009), and thus the potential effects of burnout and mental fatigue on driving performance and safety are important to consider.

#### **2.4.3 Physiological Effects of High Stress and Traumatic Circumstances**

When an individual is exposed to high stress, traumatic or catastrophic circumstances, vision, cognitive processing and motor skill performance all break down. This may impair the driving ability and performance of individuals during such adverse conditions (e.g. in the military, emergency services).

When experiencing a highly stressful event, an individual's heart rate will increase and their sympathetic nervous system (SNS) will be activated, releasing the stress hormone adrenaline. As a result, a number of virtually uncontrollable psychological and physiological changes occur throughout the body. For example, the individual's heart rate will likely increase and vasoconstriction (the tightening of blood vessels) will likely occur. This vasoconstriction reduces the amount of oxygen entering the brain, which can largely impair vision and, in particular, reduce the peripheral field of view (i.e. 'tunnel vision'; Breedlove 1995). In addition, this response to high stress can result in excessive pupil dilation, leading to the loss of near vision and disrupting the ability to focus properly, leading to a loss of depth perception (Cannon 1915). Cognitive processing, rational thought and decision-making are also believed to be largely impaired due to this stress response (i.e. reduced oxygen to the brain), which may account for why some individuals often report operating in 'autopilot' mode, where their actions and behaviours often occur without conscious thought and deliberation (Grossman & Siddle 1998).

Fortunately, most individuals will not be exposed to this level of stress and trauma, and will therefore not experience such perceptual and cognitive impairments. However, some individuals will experience such stress and trauma as part of their work position (e.g. ambulance officer, police officer, military personnel) and will have to subsequently (or concurrently) safely navigate a vehicle (e.g. police officer driving during a chase).

## 2.5 Individual Differences in the Experience and Effects of Driver Headspace Events

Different things are stressful for different people. That is, what stimuli are perceived to be stressful in nature and how stressful they are, depend largely on the characteristics of the individual. Two aspects of individual differences in the literature have shown to play an important role in the process by which stressful events may influence the psychological state of an individual — personality and social support. As such, these factors may potentially moderate the impact of stressful events on driver headspace.

### 2.5.1 *Personality*

A number of personality traits have been identified in the literature as being important in determining the psychological impact on an individual by a stressor. These include (but are not limited to):

- **Locus of control:** Locus of control measures assess the extent to which individuals believe that outcomes are determined by personal effort and ability rather than by external influences such as fate, change, and powerful others (Rotter 1966). Individuals with an internal locus of control may be more likely to deal with, and attempt to reprieve, stressful situations (e.g. put in more hours to meet a tight deadline at work); whereas those with an external locus of control feel that adverse circumstances are completely out of their control and may not be as willing to deal with them (the 'roll over and die' mentality), and become increasingly stressed as a result.
- **Hardiness:** Hardiness describes an assortment of dispositional characteristics, including a strong sense of self and self-efficacy (Kobasa 1979). For the same stressor, similar to locus of control, a hardier individual will be more likely to attempt to deal with a stressor as they believe that they have the ability to do so (e.g. 'rise up to the challenge').
- **Neuroticism:** Neuroticism is a personality trait reflecting vulnerability to feeling negative emotions. For the same stressor, a more neurotic individual will find it more stressful and experience more intense negative emotions in response, compared to a less neurotic person.
- **Dispositional optimism:** Dispositional optimism is defined as a global expectation that more good (desirable) things than bad (undesirable) will happen in the future (Scheier & Carver 1985). For the same stressor, an individual with higher dispositional optimism will be more likely to view the stressor in a positive light (e.g. see the glass 'half full' rather than 'half empty').

When experiencing negative work or life events, these personality differences are likely to play an integral role in determining the level of stress experienced by individuals and the impact on their driver headspace. Based on this research, it is likely that: (a) an internal locus of control, (b) a high level of hardiness, (c) a low level of neuroticism, and (d) high dispositional optimism, will have a protective effect on a driver's headspace from being adversely impacted by stressful events.

### 2.5.2 *Social Support*

Research suggests that individuals with a higher level and quality of social support may be better protected from the detrimental effects of adverse and stressful events and circumstances, both within and outside the workplace (see 'Stress Buffering Theory'; Cohen & Wills 1985). As a result, one's level of social support may also confer an important individual difference in coping with driver headspace events.

For example, earlier studies suggest that people with spouses, friends and family members who provide psychological and emotional resources are better able to handle negative life events, and remain mentally healthier than those with fewer supportive contacts (see Cohen & Wills 1985 for review). More recently, a large epidemiological study found that a high level of social support was associated with significantly reduced odds of psychological distress after experiencing specific life events (Maulik, Eaton & Bradshaw 2010). Research also shows the benefits of high social support within the workplace, with one study linking it to reduced likelihood of mental health problems and/or prolonged sickness absence (Michie & Williams 2003).

This research suggests that social support is an important factor in determining the psychological impact of stressful life events, and therefore an important one in the realm of driver headspace. A social network can provide the perception that others will provide the necessary resources to deal with negative life and work situations, and therefore bolster one's perceived ability to cope with them as they are not perceived to be as stressful (Baqtayan 2011). The concept of social support (or lack thereof) may be especially relevant for the driver headspace of long-haul drivers, who tend to be away from home for days or weeks at a time drive (Shattell et al. 2012). As such, these drivers may perceive the strains of the job as being particularly stressful, therefore adversely impacting their driver headspace.

## 2.6 Strategies Drivers Use to Deal with Driver Headspace Events

There are a number of strategies that drivers may use to deal with headspace events, some of which are outlined below.

### 2.6.1 Emotion Self-regulation

When most individuals are feeling stressed, they will typically first attempt to reduce the stress or 'deal' with it themselves. In essence, the individual attempts to self-regulate (namely reduce) the stress and other negative emotions that follow an adverse set of circumstances. According to Gross (2002), an individual may be able to use a number of different strategies to deal with emotionally stressful situations and therefore mitigate the negative impact of driver headspace events, including:

1. **Situation selection** – choosing which potentially stressful situations to approach and which to avoid. An example of this strategy may be a train driver quitting his/her job following a suicide attempt in order to prevent experiencing that event again.
2. **Situation modification** – modifying a situation in an attempt to change its stress and emotional impact. An example of this strategy may be a bus driver choosing to ignore verbal abuse from an unruly passenger as opposed to engaging in conflict, as the latter would likely have evoked a higher level of stress.
3. **Attentional deployment** – involves directing one's attention towards, or away from, a stressful and emotional situation. This may include distraction (i.e. diverting attention away from a stressful stimulus) and suppression (i.e. redirecting attention from specific thoughts and mental images to other less stressful content). An example of this strategy may be drivers attempting to distract themselves from financial worries by thinking about loved ones while driving.
4. **Cognitive reappraisal** – involves changing the meaning of a situation or event to alter (reduce) its stress and emotional impact; synonymous with '*seeing the glass half full*' type thinking. An example of this strategy may be when a paramedic chooses to focus on his/her efforts toward saving a patient's life (e.g. driving them to hospital) as opposed to focusing on the injuries sustained by the patient.

5. **Response modulation** – involves attempting to directly influence behavioural and physiological response systems. An example of this strategy may be the heavy use of caffeine by long-haul heavy vehicle drivers to increase driving productivity and reduce the stress associated with time pressures.

### **2.6.2 Mindfulness Techniques**

Knowledge of mindfulness techniques to help combat stress and other adverse circumstances may help to optimise driver headspace while driving.

Mindfulness is defined as the tendency to intentionally attend to present-moment internal and external experiences with an attitude of openness and acceptance (Kabat-Zinn 2005). It is concerned with accepting, rather than suppressing, emotional states (Kabat-Zinn 2005), and is typically associated with meditation and relaxation-type techniques (e.g. breathing exercises, concentration on respiration, focusing only on the present; Brown, Ryan & Creswell 2007). Such techniques may be employed by a stressed driver to reduce 'tension' and improve driver headspace.

Research shows that mindfulness techniques can be beneficial to a number of aspects of physical and mental health, including stress problems (Kabat-Zinn et al. 1992 Carmody & Baer 2008). Mindfulness has been shown to alter both lower-level processing, such as simple reaction time (van den Hurk et al. 2010), and upper-level cognitive processing, such as attention, executive functioning and working memory capacity (for a review, see Chiesa, Calati & Serretti 2011).

In the realm of driving, mindfulness techniques have been shown to be associated with a number of benefits.

Kass et al. (2011), for example, found that those trained in a mindfulness-based psychology course and mindfulness techniques displayed higher levels of concentration and situational awareness, and less collisions with pedestrians during a simulated driving task. In addition, Terry and Terry (2014) found that two facets of mindfulness were negatively associated with near-accidents. Those who scored lower on acting with awareness and non-judging of inner experience had a higher incidence of near-accidents when conversing and texting on the phone, even after controlling for frequency of phone conversations while driving.

Overall, this research suggests that individuals with knowledge and experience in using mindfulness techniques are more likely to display safer driving behaviour. Since such techniques may be beneficial in relieving stress, this may allow the driver to redirect attention and focus on the primary driving task at hand (as opposed to processing stressful thoughts, etc.), thereby improving driver headspace.

### **2.6.3 Employee Assistance Programs (EAPs)**

When a driver is feeling stressed, is driving under negative or adverse circumstances, or simply feels they are not mentally fit to drive, they may approach their organisation's Employee Assistance Program (EAP) for support.

EAPs are an employer-funded resource offered to employees and (usually) their families. The primary service undertaken by an EAP is professional assessment, referral, and short-term counselling directed at personal, social, or work-related problems that might impede the performance or mental health of the employee (Carroll 1997). Services such as individual counselling, stress management, critical incident stress debriefing, trauma debriefing, wellness programs, meditation, change management and managerial coaching are also typically available.

Evaluations of EAPs have been promising. For example, an early report commissioned by the Australian Commonwealth Department of Health in 1993 (Keys-Young 1993) noted that, across the 11 EAP providers surveyed nationally, 70–80% of employees who had used the services regarded them as effective or satisfactory. More recently, two large reviews produced by the British Association for Counselling and Psychotherapy reported that counselling within the workplace was successful in assisting in reducing stress, depression and anxiety symptoms among employees (McLeod & McLeod 2001; McLeod 2008). However, it is difficult to provide a valid and definitive evaluation of EAPs due to a number of reasons, including: (a) non-independent evaluations, (b) confidentiality issues, and (c) the fact that there is no agreed definition of what exactly constitutes an EAP.

There is a lack of specific research on the evaluation of EAPs and other indices of workplace counselling for professional driving occupations. However, the available research may indicate that EAPs could be a promising option for drivers experiencing a negative or stressful event by receiving psychological aid and mitigating against the adverse effects of stress on their driver headspace.

## 2.7 Impact of Driver Headspace Events on Driving Performance and Safety

In this section, research will be presented that provides an insight into how different phenomena, such as general life stress and specific mental health issues, impact on driver headspace, and their link to driver behaviour and crash risk.

### 2.7.1 Life Stress and Driving

A number of studies suggest that life stress may adversely impact driving performance and safety. Research gleaned from the literature review can be found in Table 2.1.

Table 2.1: Life stress and driving safety

Study	Methodology	Findings
Brenner and Selzer (1969)	Study where 96 deceased and surviving fatal accident drivers were compared to 96 matched control drivers on information relating to exposure to stressful experiences within the preceding year.	Social stress (e.g. serious personal conflict with significant other, personal tragedy) was related to fatal road accidents. Drivers with social stress were found to be five times more likely to cause a fatal accident than drivers without such stress.
McMurray (1970)	Analysed the driving records of 410 people involved in divorce proceedings (comparison of records before and after the divorce filing).	Accident and violation rates were significantly higher post-divorce.
Mayer and Treat (1977)	Thirty young drivers with a high accident record were compared to 30 drivers with no accident record on a number of self-report questionnaires.	The concept of 'personal maladjustment' (inclusive of emotional strain, manifest anxiety, and personal arguments) was shown to be associated with increased risk of crash involvement.
Hartley and El Hassani (1994)	Accident and violation records of 500 truck and 500 car drivers were associated with self-reported stress.	Stress linked to work-related demands and psychological health predicted 30–40% of the variance in accident or violation reports.



Study	Methodology	Findings
Norris, Matthews and Riad (2000)	A longitudinal study examining the occurrence of motor vehicle accidents in a sample of 500 drivers.	High job stress predicted future motor vehicle accidents. Financial stress increased the likelihood or involvement in more serious accidents.
Legree et al. (2003)	Meta-analytic study linking stress and vehicle accident risk.	Stress and emotional states predicted elevated crash risk.
Lagarde et al. (2004)	Data from a French cohort study was analysed, including a retrospective driving behaviour questionnaire (sample 13 915 drivers).	Marital separation or divorce was associated with an increased risk of a serious accident (2.9 times more likely).
Martiniuk et al. (2010)	Police report crash data from a prospective cohort study of 20 822 novice drivers was linked to an online questionnaire measuring general psychological distress.	Compared to the reference group with low or no distress, a protective effect against crash was observed for young people who reported a moderate amount of psychological distress (relative risk = 0.85–0.87). One possible explanation may be that the mild anxiety associated with moderate levels of distress could heighten vigilance while driving.

Together, the findings suggest that the stress an individual may experience in relation to negative events and circumstances in one's life may easily transfer to, and have a negative impact on, one's driving ability and safety. Adverse circumstances and life stress, such as going through divorce proceedings or financial problems, may evoke daily worries and a range of negative effects (e.g. sadness) in an individual as a response. The cognitive distraction and other impairments (see Section 2.4) associated with this type of stress may be especially pronounced when an individual attempts to perform another activity such as driving, which as a result, is impaired. This finding may account for why 'life stress' has been associated with poorer driving behaviour and likely indicates the negative impact such life events can have on a driver's headspace.

### 2.7.2 Mental Health Issues and Driving

Negative and stressful events and circumstances in an individual's life can severely affect his/her mental health. Such mental health issues may adversely impact on a driver's headspace and consequently impair his/her ability to drive safely.

The relationship between mental health issues and driving safety is a topic that has received very limited empirical attention — a surprising finding given the commonality and prevalence of mental health issues both locally and internationally (e.g. approximately one in five Australians will experience a mental illness; Australian Bureau of Statistics 2007). The two most common mental health issues in Australia are depression (affecting one in six Australians) and anxiety (affecting one in four Australians) and will therefore be the foci of our examination in relation to driver headspace and driving safety.

#### Anxiety

As noted previously in Section 2.3, anxiety and related mental health issues (e.g. post-traumatic stress) are relatively common across many occupations where driving plays an integral role. Anxiety is defined as 'a feeling of worry, nervousness, or unease about something with an uncertain outcome' (Oxford Dictionary 2016). Extreme and persistent levels of anxiety may signal an anxiety disorder; however, most individuals have experienced sub-clinical symptoms of anxiety at some point in their lives (e.g. worried about being late while driving to work). For example, a

train driver may develop post-traumatic stress after witnessing a person attempt suicide by jumping in front of their train, and then constantly worry about this reoccurring when back at work. Similarly, a paramedic may become severely anxious regarding the nature of the emergency scene that he/she may have to attend to next while driving to and from the hospital.

The experience of anxiety is associated with a number of driving decrements and potential safety risks. For example, research shows that anxious individuals tend to report more failures of observation that may be hazardous to others (e.g. failure to check mirrors before changing lanes), more absent-minded behaviours, and more departures from safe driving behaviours such as disregard for the speed limit (Shahar 2009). In addition, a recent study showed that anxiety was a significant predictor of driving lapses (attentional and memory failures related to driving; Wong, Mahar & Titchener 2015). There is a lack of research, however, on how anxiety and associated driving impairments may translate into increased crash risk.

In general, the authors of these respective studies converge in accounting for the driving impairments associated with anxiety. Specifically, it is argued that worry (the main cognitive component of anxiety) impairs driving by diverting some of the processing and storage capacity of the working memory system, resulting in cognitive overload on tasks that place high demand upon working memory (see 'Processing Efficiency Theory'; Eysenck & Calvo 1992). Stated differently, the experience of anxiety may impact on driver headspace by increased processing of internal stimuli (e.g. worrisome thoughts, perceived threats) as opposed to important driving-related information. These processes can act as a cognitive distraction and divert attentional resources away from the primary driving task.

### *Depression*

Like anxiety, the commonality of depressive symptoms (see Section 2.3) makes it an important mental health issue to research in terms of its effect on driver headspace and driver safety.

Depression is a state of low mood and aversion to activity that can affect a person's thoughts, behaviour, feelings and sense of wellbeing (Salmans 1997). More generally, depression has been associated with a number of impairments in human performance, such as mental flexibility and decision-making (Airaksinen et al. 2004), attentional shifting (Purcell et al. 2001), and visuomotor control processes (Sabbe et al. 1999). Bulmash et al. (2006) notes that depression is marked by a preoccupation with worrying or melancholic thoughts, which may negatively impact on driver headspace and impair driving performance through cognitive distraction.

Depression symptoms have also been specifically linked to impaired driving performance. For example, a simulated driving study found that depressed individuals exhibited slower steering reaction times and had an increased number of crashes when compared to healthy controls (Bulmash et al. 2006). The authors also note that depressive symptoms are linked to attentional lapses when attempting to divide attention between multiple driving sub-tasks such as checking blind spots, controlling speed, and changing lanes, which may be attributed to their preoccupation with driving-unrelated thoughts.

A recent review of driving studies by Wickens, Smart and Mann (2014) concluded that depressed drivers encounter difficulty with reaction time, divided attention, reaction to changing speeds when following another vehicle, and weaving within the lane in a driving simulator.

In addition, there is preliminary research suggesting that these driving impairments may translate into elevated crash risk. For example, a 2009 survey of Australian heavy vehicle drivers showed that severe and extremely severe depression symptoms were associated with more than a

four-fold increase in the risk of a collision and a five-fold increase in the risk of a near-miss (Hilton et al. 2009).

## **2.8 Preventing and Mitigating the Effects of Driver Exposure to Driver Headspace Events within the Workplace**

In light of the research discussed in Section 2.7, organisations need to take action to prevent and alleviate the impact of adverse and stressful events on an individual's psychological wellbeing, particularly those that are work-related. In turn, this will help ensure the individual has an optimal driver headspace when operating a vehicle, whether it be a part of their job or otherwise. Life stress and negative circumstances outside of work are often uncontrollable and inevitable. However, organisations have the opportunity to address stress that may impact on driver safety that derives from within the workplace, which will be the focus of this section.

### **2.8.1 Enhancing Recruitment/Selection Processes**

Particular recruitment and selection processes at the initial stages of employment may help moderate the experience of work-related stressors and help mitigate the negative impact of such circumstances on driver headspace. For example, for professional driving occupations, driver selection may be partly based on selecting individuals with certain characteristics, as gauged through psychometric assessments, which are believed to be associated with resilience to stress-related symptoms derived from specific stressors that are likely to be encountered in that job (e.g. passenger abuse for bus drivers). This may improve the suitability or 'fit' of the individual to the particular driving-related job, in terms of having the ability to tolerate and deal with stressors that may be associated with it in a healthy manner (i.e. does not negatively impact on driver headspace).

At the time of recruitment and selection, it may also be beneficial to inform the potential worker of both the positive and negative aspects of the work in order to help them develop a more accurate expectation of the job (Mottram & Flin 1988). This strategy may help achieve a better fit between the worker and the work environment, set more realistic expectations regarding a 'day in the life' of the job, and lead to a workforce that is more resilient to the psychological strains of the job. As a result, this may produce fewer negative health outcomes and behavioural consequences such as absenteeism and turnover (French, Caplan & Van Harrison 1982). If stressors associated with the occupation are expected and perceived to be 'normal', it is likely that the individual will be better equipped to deal with them appropriately, and therefore have minimal impact on the driver's headspace if driving.

### **2.8.2 Strategies/Interventions to Promote a Driver Headspace-friendly Workplace**

Driver headspace may be best conceptualised as a state, not a trait, implying that it can fluctuate and change from day to day. This means that organisations and management can put a number of strategies in place to prevent driver headspace events. According to Harvey et al. (2014), three broad aims of stress management include:

1. **Primary Prevention:** interventions that are proactive and aim to reduce exposure to psychological and physical risk factors in the workplace among workers.
2. **Secondary Prevention:** interventions that aim to manage symptoms and, in the context of the workplace, are typically implemented after a worker develops symptoms or begins to complain of stress. These interventions also aim to equip workers with coping strategies to deal with stressors in an adaptive manner, thus reducing the likelihood of mental health issues.



3. **Tertiary Prevention:** interventions that are reactive and aim to minimise the impact that a diagnosed disorder has on daily functioning.

In order to provide a mentally healthy workplace, and to reduce the negative impact of workplace stressors on driver headspace, organisations and management need to ensure there are mental health strategies targeting each of these three prevention stages. Harvey et al. (2014) argue that a mentally healthy workplace can be achieved via interventions in six key domains, as described below.

*Designing and managing work to minimise harm*

This domain involves a proactive approach of identifying work-related stressors that are likely to be encountered by workers, and removing/reducing them so as to prevent stressful experiences and psychological strain. For example, recommendations to address two commonly-cited workplace stressors for professional drivers include:

- Timetables, shift schedules, and the quality of break periods:
  - Adequate rest periods between working days (days off should be in blocks of two rather than single days off to help achieve this).
  - Same shift time when working over consecutive days to help sleeping patterns. Good quality of sleep is crucial to combating subsequent fatigue symptoms while on shift (see NRSPP & Harrington 2015).
  - No split shifts (i.e. working a few hours early morning followed by several hours in the evening).
  - Provide opportunities for workers to have control of their work schedules (e.g. some drivers would prefer working day shifts as opposed to night shifts).
  - Adequate rest break(s) during shift and access to amenities (e.g. food, bathroom, etc.).
- Ergonomics of driver's cabin:
  - Position of the physical driving environment should be adjustable to suit the particular driver at that time (e.g. adjustment of the seat, steering wheel and pedals).
  - Periodically maintain cabin with timely repair and replacement of used/outdated parts and technology.

*Promoting protective factors at an organisational level to maximise resilience*

At the organisational level, a number of strategies can be put in place to improve a worker's resilience to stress and mental health issues and, in turn, minimise the likelihood of driver headspace events. Harvey et al. (2014) offer the following strategies:

- Build a psychosocial safety climate – ensure management have a real concern for the mental health of workers. This will typically include providing managers with training in mental health education.
- Develop anti-bullying policies – a lack of policies and regulations against bullying can be perceived as indirectly condoning this negative and distressing behaviour.
- Enhance organisational justice – make sure workers perceive fairness in the workplace (e.g. workloads not too high, adequate benefits, etc.).
- Use team-based interventions – to encourage communication and social networks to be formed.

- Train managers on how to manage organisational change effectively (e.g. restructuring, mergers, etc.) and to help workers cope with, and alleviate, the high stress commonly reported during these periods.

### *Enhancing personal resilience*

Resilience training and stress management courses can be used to enhance a worker's ability to cope with stressful situations that may arise or are likely as part of the work position.

Individual-level stress management training seeks to educate workers about stress and its associated health effects, and to teach coping and stress reduction skills (Bickford 2005). In addition, Bickford (2005) notes that training usually consists of some form of relaxation exercise (e.g. breathing exercises) in combination with cognitive techniques borrowed from the fields of counselling and psychotherapy. Elements of administrative skills, such as time management and organisation; and interpersonal skills, such as delegation and assertiveness, may be included (Bickford 2005). Such interventions and training may improve a worker's repertoire to deal with changes in driver headspace.

### *Promoting and facilitating early help-seeking*

Access to services and aids within the workplace that are aimed at improving the mental health of workers should be readily promoted throughout the organisation. Harvey et al. (2014) recommends the following:

- EAPs should be implemented and easily accessible to all workers. They should use experienced staff and evidence-based methods, and be completely anonymous.
- Wellbeing checks and health screening should be employed to identify workers at increased risk of mental health issues. This can be done via face-to-face interviews or self-report questionnaires. These are advantageous as they can identify symptoms earlier and facilitate early treatment. See Appendix B for a sample self-report stress questionnaire.
- Appropriate responses to potentially traumatic events to reduce the likelihood of subsequent mental health issues (e.g. post-traumatic stress) must have been evaluated fully and based on the best available evidence. For example, a widely used technique for emergency service workers, the Critical Incident Stress Debriefing, may actually have detrimental effects and therefore should not be used (Harvey et al. 2014).

As previously noted, access to treatment for truck drivers is usually minimal due to them being away for prolonged periods of time. However, Shattell et al. (2012) note that online support and telehealth assessment and treatment efforts for truck drivers have the potential to help close the gap in mental health care access that is common for this occupation.

### *Supporting worker recovery from mental illness*

A number of strategies can be put in place to aid and support workers to recover from mental illness. Harvey et al. (2014) offers the following recommendations:

- Supervisor support and training – mental health training should be provided to managers, and they should be encouraged to keep in regular contact with workers that may be off work and recovering.
- Partial sickness absence – organisations should provide recovering workers more flexibility around work hours, position duties and responsibilities (e.g. 'ease back into it').

- Work-focused exposure therapy – therapy designed to alleviate and deal with anxiety or post-traumatic stress associated with the workplace. This may be especially relevant in the case of emergency services drivers.

Harvey et al. (2014) note that work can play a beneficial role in recovery from mental health issues, and that the assumption of full recovery before returning to work is outdated.

#### *Increasing awareness of mental illness and reducing stigma*

Harvey et al. (2014) note that interventions and strategies should be aimed at increasing awareness and acceptance of mental health issues within the workplace, which in turn may address a substantial barrier to mental health help-seeking — the stigma. Examples of effective initiatives or programs include:

- Mental Health First Aid – aims to educate workers on how they could help others who were in a mental health crisis and/or in the early stages of mental problems.
- Mental health education – provides access to mental health information and resources as well as promotion of mental health-related events (e.g. R U OK? Day, World Mental Health Day).

### **2.8.3 Signs of Stress in the Workplace**

The above strategies listed in Section 2.8 may very well be in place; however, a worker may be experiencing difficulties and adverse circumstances outside of the workplace, which are more difficult to gauge and control. The effects of such events may transfer over into the workplace, which will primarily include driving for some work positions.

Therefore, it is important for managers and supervisors to be able to recognise the general signs of stress among workers to ensure timely action to help address them. Signs of stress in the workplace can include (but are not limited to):

- Changes in emotional state of the worker – stress will affect individuals differently, so some may become more disinterested or deflated at work. Others may appear overwhelmed, anxious, or even aggressive.
- An increase in sick days and other absenteeism.
- A decline in the individual's work performance.
- Cognitive difficulties – stress may cause workers to suffer a reduced ability to concentrate. Indecisiveness and poor judgement are also signs.
- Fatigue or tiredness – workers may develop sleeping difficulties such as insomnia, making it hard for them to stay at work. Irritability and being seemingly 'jumpy' are also signs.
- Physical illness such as headaches, nausea, aches and pains.

There is no doubt that all of us, or someone we know, has experienced these symptoms of stress. However, when assessing the presence of workplace or other-related stress, one has to look at patterns of behaviour for a period of time, not just one isolated incident (Lambert, Lambert & Yamase 2003).

Although general in nature, the intervention strategies discussed in this section aim at reducing workplace stress and other mental health issues at the job design level, individual level, team level and organisational level. Together, these interventions may be employed to effectively contribute to a mentally healthy workplace and minimise the likelihood of workplace stress 'spilling' over to other

parts of a worker's life, such as their driving; that is, to ensure a driver's headspace is not negatively impacted on.

### 3 FOCUS GROUP

The authors conducted a focus group in which individuals from a variety of organisations were invited to share their experiences and thoughts on the driver headspace issue and its importance to their respective organisations. Specifically, the focus group aimed to explore the perceptions of the driver headspace issue, including how it may be best defined, its prevalence, and the mechanisms by which it affects driver performance and safety.

This section of the report presents the major findings and themes derived from this focus group.

#### 3.1.1 Method

The authors began by informally interviewing key members of the NRSPP to identify topics for exploration in the focus groups. This included the prevalence of driver headspace, how prominent an issue driver headspace is in their respective organisations, and what protocols are in place to address the issue across different organisations.

By using this feedback, and information gleaned from the initial literature review, a draft *moderator's guide* was developed. The authors pilot-tested questions with five volunteers within ARRB, assessing it for understanding by having the volunteers rephrase the questions in their own words, and then made minor modifications to finalise the guide. The moderators used a semi-structured format with open-ended questions initially, followed by probes. The focus group was 60 to 90 minutes long and moderated by the two authors. Participants provided informed consent before commencing in the focus group (Appendix C).

The focus group was conducted in the morning of Thursday 22 October 2015 and lasted approximately two hours. A series of open-ended questions was used as the basis of discussion. These questions (see Appendix D) were formulated to be broad, inviting participants to respond according to however they understood the question, and not presupposing any prior knowledge of the driver headspace subject.

Participants were recruited via word-of-mouth from key partners within the NRSPP Driver Headspace Working Group (i.e. snowball strategy). More than 20 individuals were invited to participate in the focus group(s), however only two individuals were available: one from a national security service and the other from a large local council.

The focus group took place in a quiet room at ARRB's Sydney office in Ultimo. The two authors were present at the focus group; one facilitated the discussion and the second was an observer. The discussion was recorded digitally and field notes were recorded by the second author.

For analysis of the data, the taped discussion was listened to, and used together with the notes taken during the session, to perform a high level thematic analysis (i.e. noting patterns and commonalities across the data and information provided by the participants that were most relevant to the primary research aims).

#### 3.1.2 Findings

The information gleaned from the focus group was arranged and categorised according to the aims noted previously in Section 1 .

*What is driver headspace?*

- Driver headspace is difficult to define and pin down as it may be multidimensional (e.g. driver headspace may be due to both adverse and positive events/circumstances).
- Driver headspace is the ability to take on the driving task.
- Driver headspace is the driver's psychological 'fitness' and capacity to drive safely.
- Driver headspace is highly vulnerable to change (e.g. can change drastically from one day to the next).

*What are potential sources of driver headspace?*

- Driver headspace may be adversely affected by both negative and positive experiences (e.g. excited to see a family member while driving to pick them up at the airport).
- Life stressors such as financial issues and relationship issues (e.g. domestic quarrels) are highly cited sources of driver headspace events.
- Pressures in the workplace, both real and perceived (e.g. a workload that is perceived to be too high and not achievable), can adversely affect driver headspace.
  - A specific example brought up was that of council rangers who may have strong expectations of being verbally and physically abused/threatened by the public while driving, not only to and from work, but also while driving during their working day.
- Individuals who undertake shift work may be especially vulnerable to driver headspace events associated with fatigue and sleep deprivation.
  - A specific example highlighted was that of security workers for which shifts tend to start late at night and finish early the next morning.

*What is the prevalence of driver headspace issues across (their) different sectors and organisations?*

- A Sydney Council – it is estimated that driver headspace issues affect around 90% of workers in this council. It is believed that verbal abuse and threats are common for workers within this organisation and may have adverse effects on their mental health (it is noted that complaints of depressive symptoms were particularly common). Parking rangers and heavy vehicle (waste drivers) may be especially vulnerable to these adverse workplace circumstances. In addition, it is believed that the high incidents of minor crashes within this sector may be due to workers having to drive after receiving verbal abuse and threats as part of their work.
- A security firm – it is estimated that the driver headspace issue affects most security drivers within this organisation primarily due to the late night shift work most workers undertake. It is believed that since workers can change and swap their shifts as they like, some workers forgo proper rest periods in between night shifts and therefore may be more likely to be fatigued and sleep-deprived when driving in their shift.

*What are the mechanisms that underlie how driver headspace events impact on driver headspace?*

- A lack of attention that can be used for the driving task due to fatigue and sleep deprivation.
- Attention may be drawn toward cognitive processes such as worrying and other thoughts unrelated to the driving task, leaving less resources to be devoted to activities critical for safe driving (e.g. cognitive distraction).



- Deficiencies in cognitive processing and performance associated with mental health issues (e.g. high distractibility and not being able to concentrate on the driving task due to anxiety).

*What factors play a role to account for individual differences in driver headspace?*

- The ability to suppress negative thoughts, worries and anxiety – some individuals are able to 'switch off' or 'cut out' such driving-unrelated thoughts and focus on the driving task at hand.
- Driver's visual-spatial ability – for drivers that have more automated driving skills and know the area in which they are driving well, it is suggested that there is less chance of interference from a driver headspace event (e.g. reduced driving impairment derived from cognitive distraction).
- Social support – drivers with a higher level of social support (including social, family and workplace) will be more likely to handle stressful events effectively.
  - A specific example brought up in this regard is that the security firm involved tends to ensure that workers that are sent home due to not being psychologically 'fit' to drive have someone at home, or elsewhere, to support them.

*What are strategies to reduce the occurrence of, and driving impairments associated with, driver headspace events?*

- Attempting to self-regulate and 'switch off' from the negative thoughts and feelings associated with a stressful event in order to concentrate on the driving task at hand.
- Employee Assistance Programs and other worker support systems that can be used when experiencing stress within the workplace.
- Participation and advertising of workplace mental health initiatives (e.g. R U OK? Day) in order to promote help-seeking behaviour in times of stress and to reduce the stigma attached to mental health issues.
- Parking rangers are sometimes taught 'verbal judo', which involves conflict resolution techniques with the aim of de-escalating heated situations that are often encountered in their day-to-day work.
- Advertising Man Therapy – an online resource aimed at providing information and links to help for anxiety and depression issues in males.
- Management ensuring workers are not sent back to work prematurely after experiencing a highly stressful or traumatic event.
- Mindfulness, meditation, and breathing techniques aimed at reducing stress.

*What specific impacts on driving performance are likely to occur due to experience of driver headspace events?*

- Lack of sustained concentration and focus on the driving task due to driving-unrelated thoughts (e.g. cognitive distraction).
- Impaired detection of important and/or hazardous road-related cues (looking but not seeing), may lead to late braking responses.
- Loss of situational awareness due to lack of attention to the driving task may lead the driver to make inappropriate or delayed responses to traffic changes and/or critical events.
- Impaired judgement of vehicle speed and distance.

## 4 DRIVER DISTRACTION AND INATTENTION WORKSHOP OUTPUTS

A workshop was convened for the 4<sup>th</sup> International Conference on Driver Distraction and Inattention (DDI) (9–11 November 2015, Sydney, Australia) to introduce and discuss the driver headspace issue. The workshop consisted of 5 x 10-minute presentations, followed by a 40-minute Q&A session with five panellists. The presenters and panellists were:

- Mitchell Cunningham (ARRB Group)
- Prof. Kristen Pammer (Australian National University; ANU)
- Dr. Sarah Jones (Toll Group)
- Andrew Pitt (Tasmanian Emergency Services)
- Mark Stephens (Fleet Operations Manager, United Care Queensland).

### 4.1 Information Gleaned from the Presentations

Information from the presentations (excluding Cunningham; findings from his presentation are included in this report) are summarised below.

#### 4.1.1 *Stress and Cognitive Load – Prof. Kristen Pammer (ANU)*

- The experience of a stressful event or circumstance is akin to having a high cognitive workload. Linking this to driver safety, when a driver is experiencing high stress, their cognitive workload may be especially high. This can lead to degraded hazard perception (e.g. through inattention blindness), and this issue may be especially relevant to novice or younger drivers who are not as adept at driving.
- When drivers experience such stress and cognitive load, they may have trouble staying focused, trouble staying in control, and difficulties maintaining appropriate situational awareness (i.e. not knowing what is going on along the road and vehicle environment around them).
- Stress results in poor attention because there is no driver headspace left to detect hazards/respond to an emergency.
- A driver in a stressed or distressed state may be more likely to:
  - experience impaired observation and reaction times
  - fail to recognise situations, such as traffic or road changes
  - not be able to predict or determine what other drivers are doing
  - engage in riskier manoeuvres
  - lose the ability to perform driving skills that require precise timing or other subtle skills
  - feel as though he or she is detached from other drivers, vehicles and conditions on the road.

#### 4.1.2 *Heavy Vehicle Driver Headspace – Dr. Sarah Jones (Toll Group)*

- Defines driver headspace as 'the mental and emotional state of the driver from the start of the [driving] shift through to the completion of the [driving] task'.
- For 'ideal' driver headspace, the driver should be:



- well rested and fit for duty
- fully appraised of the transport task to be completed (including being familiar with the route and truck-stop-rest options)
- attentive but not in a state of hypervigilance (which may promote fatigue and reduce energy over a long period).
- Typical sources of driver headspace events for long-haul heavy vehicle drivers include:
  - time pressures
  - customer demands (e.g. hostile interactions with customers may stress drivers)
  - enforcement interactions (e.g. unwarranted vehicle stoppages and poor treatment by enforcement may stress drivers)
  - experiencing/witnessing suicide by truck
  - body/mind factors such as sleep deprivation, public perception/status of the work position, the sedentary nature of the driving role
  - other road users' behaviour (e.g. aggression on the road).
- Countermeasures and mitigation strategies to improve driver headspace of heavy vehicle drivers include:
  - management being aware of any changes in their driver's driving routine as this may signify that something is not 'right' with the driver
  - reducing the stigma associated with admitting lack of fitness to drive, as well as promoting disclosure of mental and emotional issues a driver may be having
  - increasing the development of purpose-built residential facilities to ensure drivers get adequate rest and sleep
  - reducing driver interactions with customers
  - further implementing drug and alcohol testing, as well as offering rehabilitation services to ensure drivers are not driving under the influence and are not enticed to when feeling stressed
  - online fatigue management training to improve the driver's ability to not only recognise symptoms of fatigue, but how to efficiently reduce it.

#### **4.1.3 Critical Incident Stress Management – Andrew Pitt (Tasmanian Emergency Services)**

- Defines driver headspace according to psychological trauma through continuous events during one's work duties and pressures in their personal lives. These events essentially distract the driver and impair concentration on the driving task.
- Sources of driver headspace are diverse in nature – they can be due to experiencing or witnessing a traumatic event, or derive from workplace conflicts and outside influences (e.g. marriage breakdown).
- Driver headspace is a significant problem in this emergency sector – repeated episodes of psychological trauma have a cumulative impairment effect over time.
- Strategies used to reduce driver headspace include:

- teaching individuals to recognise the signs and symptoms of experiencing stress and negatively impacted driver headspace
  - introducing driver headspace awareness into driver training packages
  - eliminating the stigma attached to mental health issues and stress, making individuals more comfortable admitting when they may not be in the right state of mind to drive
  - better preparing supervisors to understand their duty of care, and recognising stress and negatively impacted driver headspace in their workers.
- Suggests a number of ways in which driver headspace events may impact driving, including:
    - loss of memory of the traumatic event in question, implying a lack of attention in this situation and for some time following it
    - road rage and heightened anger regarding the trauma that has been experienced
    - increased risk of both crashes and near-misses due to mind being 'off' the road.

#### **4.1.4 Driver Headspace – Mark Stephens (United Care Queensland)**

A driver's headspace may be influenced in a number of ways, including:

- new technologies
- rural and remote driving
- environmental impacts such as floods, storms, fire, etc.
- increased traffic density.

These aspects of the fleet driver work environment have the ability to distract the driver and increase crash risk. Programs aimed at managing such driver risks include:

- identification of risk (e.g. traffic infringements, crashes, complaints)
- driver education, including group driver safety awareness sessions and personalised interventions for drivers at identified risk.

## **4.2 Information Gleaned from the Q&A and Panel Discussions**

A common concern of the audience was the definition of headspace – what is it and how should it be best conceptualised? These concerns included:

- 'state of mind' may be a better term than 'driver headspace'
- the conceptualisation of driver headspace should not be linked with driver fatigue, as this may place blame on the driver
- the definition of driver headspace may be improved by specifying the type of stress that contributes to it.

Unlike states associated with high stress, headspace events may also be associated with states of low arousal. Future research should aim to examine how emergency workers respond and drive after periods of low workload (e.g. a firefighter waiting for a call). The 'quiet' shifts that emergency workers and drivers (e.g. train drivers) may be exposed to may encourage passive fatigue, which is associated with a temporary shrinking of attentional capacity (Young & Stanton 2002). Emergency or critical events after prolonged periods of monotony may erratically increase mental workload

beyond this reduced attentional capacity and impair their ability to drive safely. Therefore, driver headspace events may also result from too little stress or mental workload

While anxiety has been shown to be associated with impaired driving ability, it may also have the ability to improve driving. For example, a paramedic that attends a critical car accident may experience anxiety symptoms afterwards. However, this anxiety may help the paramedic in paying more attention to the road and the driving task as they do not want to be in a similar accident. In this case, the focus of the anxiety (threat) is driving-related and therefore serves to sustain attention on the road (e.g. watching for road-related hazards). However, when an individual is anxious about a non-driving-related stimulus (e.g. financial issues), attention will be likely diverted away from the driving task and therefore be more likely to impair driving performance.

Overall, the outputs of the Driver Headspace DDI Conference workshop reinforce that driver headspace, as a research topic and construct, is still in its infancy and requires further research. However, key members of the workshop and other researchers tended to agree that driver headspace is not only a prevalent issue within their respective organisations, particularly those for which driving plays an integral role, but one for which further countermeasures and mitigation strategies need to be developed.

## 5 DRIVER HEADSPACE SURVEY

A survey was developed to obtain information regarding the driver headspace issue from a wider audience. The questions in the survey directly related to the seven primary research aims noted in Section 1.0.

### 5.1 Method

#### 5.1.1 Participants

A total of 709 volunteer participants were recruited through a number of means:

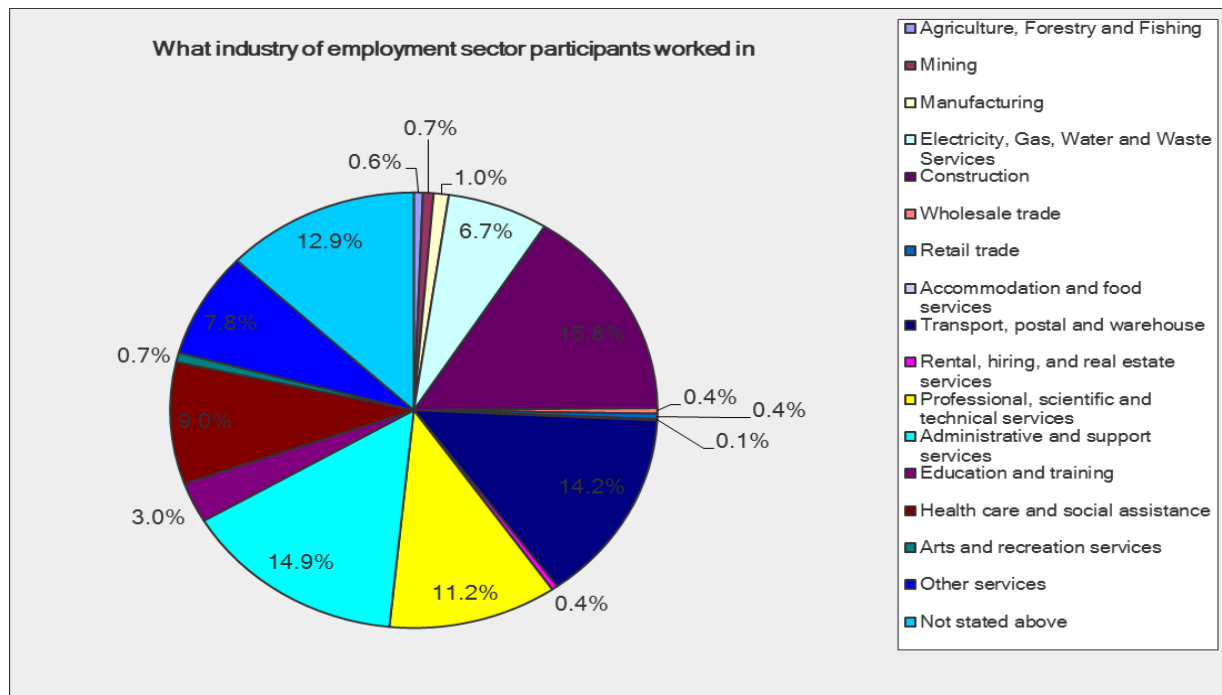
- advertising the survey through social media
- providing the survey to members of the NRSP Driver Headspace Working Group for circulation within their respective organisations
- advertising the survey as a homepage news item on the NRSP website.

Participant characteristics were as follows:

- 411 participants were male (59.2%)
- mean age was 46.59 years ( $SD = 29.04$ )
- 548 participants were born in Australia (77.3%)
- almost half the sample (47.1%) drove as part of their work position. As a proportion of the full sample:
  - 2 (0.3%) were taxi drivers
  - 2 (0.3%) were bus drivers
  - 28 (4.0%) were heavy vehicle drivers
  - 267 (38.5%) had a work position largely involved with driving a vehicle
  - 24 (3.5%) were emergency workers.

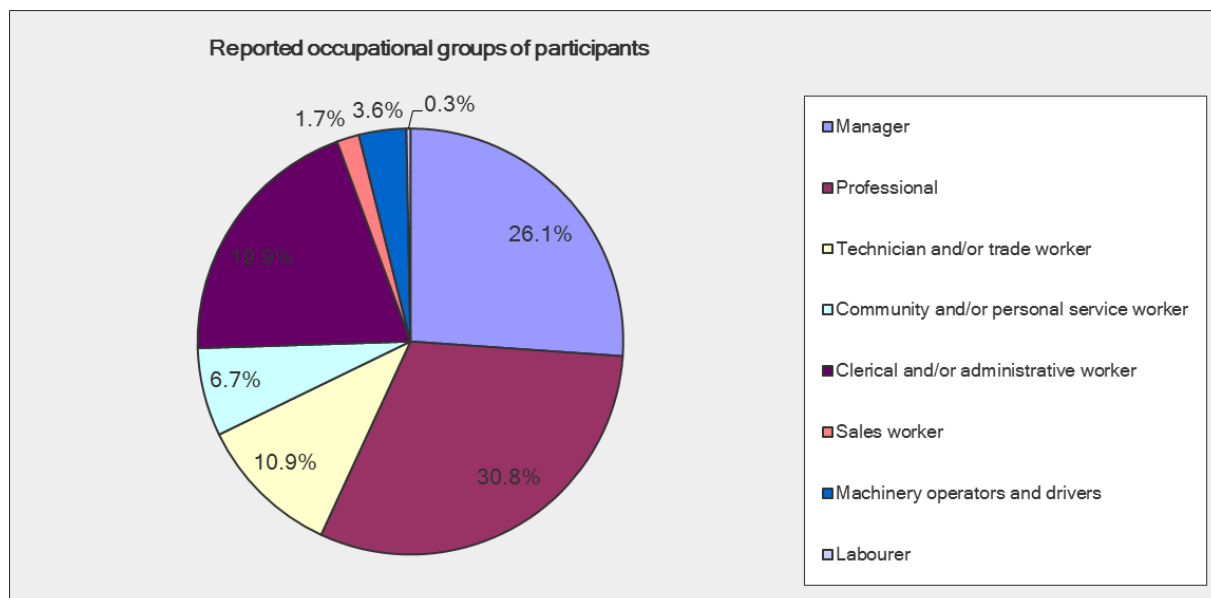
Employment sector and work position information can be found in Figure 5.1 and Figure 5.2.

Figure 5.1: Employment sector of participants



Source: ARRB Group.

Figure 5.2: Occupational group of participants



Source: ARRB Group.

### 5.1.2 Questions

See Appendix E for the survey questions.

### 5.1.3 Procedure

Participants were provided with a link to the survey, read an information sheet about the research, and then clicked a link to provide their informed voluntary consent to participate. Consenting participants were instructed to respond to the survey questions, which took approximately 5 to 10 minutes to complete. Survey Monkey was used as the online platform for participation and the survey questions were programmed to appear in a random order (except for demographic questions, which were always presented first).

## 5.2 Findings

### 5.2.1 Data Analysis

Data were downloaded from Survey Monkey to Microsoft Excel, which automatically calculated and provided descriptive analysis of means (i.e. averages) of the variables of interest. These values were subsequently used to create the figures and graphs displayed in this section.

It was deemed not appropriate to statistically analyse the data (e.g. to test whether groups of drivers statistically differed on a construct of interest) for the following reasons:

- the survey questions had not been psychometrically validated at this time
- the sample had been derived from different populations, which means groups of drivers likely differed on a range of variables (e.g. years of driving, exposure to different driving environments), which were not accounted for by the study
- sample sizes of driver groups differed substantially.

Nevertheless, given the exploratory nature of this study, the data were sufficient for gaining a preliminary understanding of the driver headspace issue.

### 5.2.2 Results

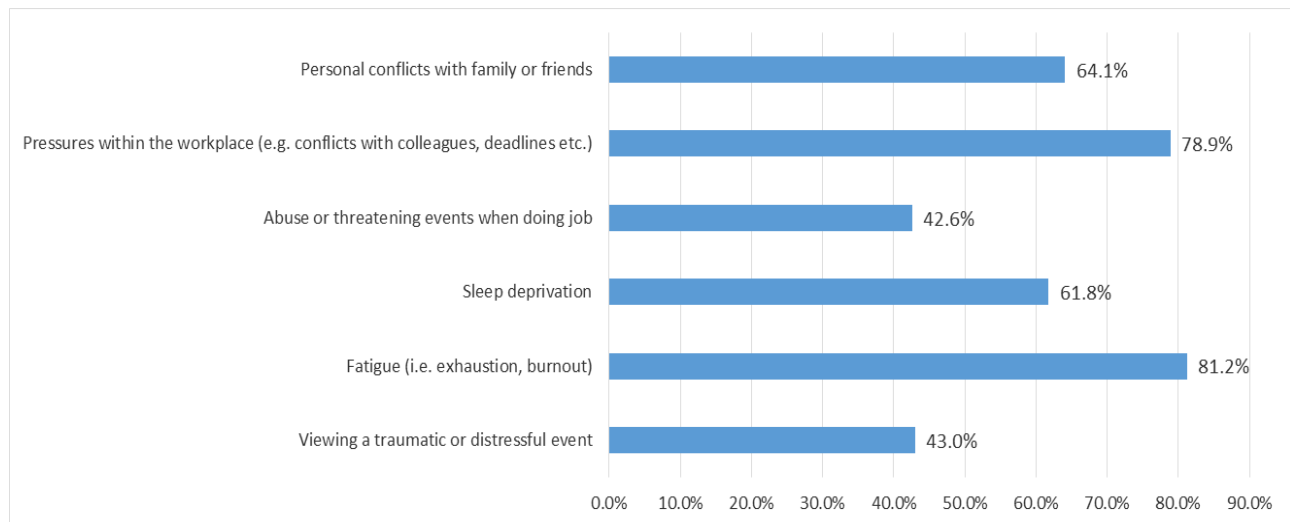
Question 1 – A driver headspace event may be an adverse or stressful event that may negatively impact on one's driving performance and safety. An example may be of an individual that is stressed out by tight deadlines at work, so they worry or dwell over it while driving to and from work, potentially taking their focus away from the driving itself. Do you agree with this definition of a driver headspace event you have just read?

- 96.2% of individuals agreed with this definition of driver headspace. A significant proportion of the individuals that did not agree with the stated definition (3.8%) noted fatigue and sleep deprivation as events that impacted on driver headspace.

Question 2 – What events or situations have led or may lead to driver headspace events (that may, in turn, impair driving performance) within your organisation? (Choose all that apply)

- **Pressures within the workplace** and **fatigue** are perceived as the most prominent adverse circumstances that can negatively impact on driver headspace (Figure 5.3).

Figure 5.3: Events perceived to negatively impact on driver headspace

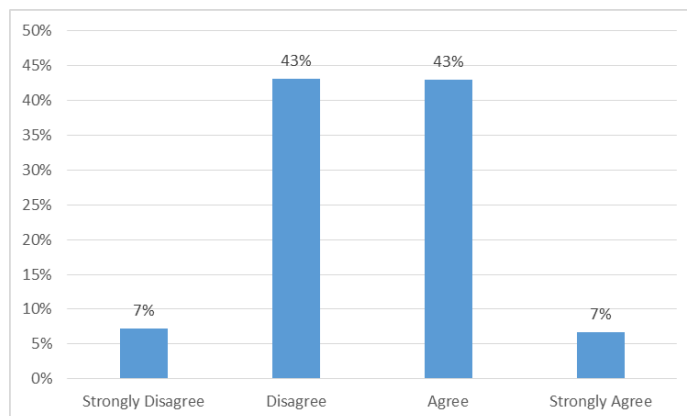


Source: ARRB Group.

Question 3 – Is the issue of driver headspace a significant issue in your organisation?

- 49.6% of participants agreed that driver headspace was a significant issue within their organisation (Figure 5.4).

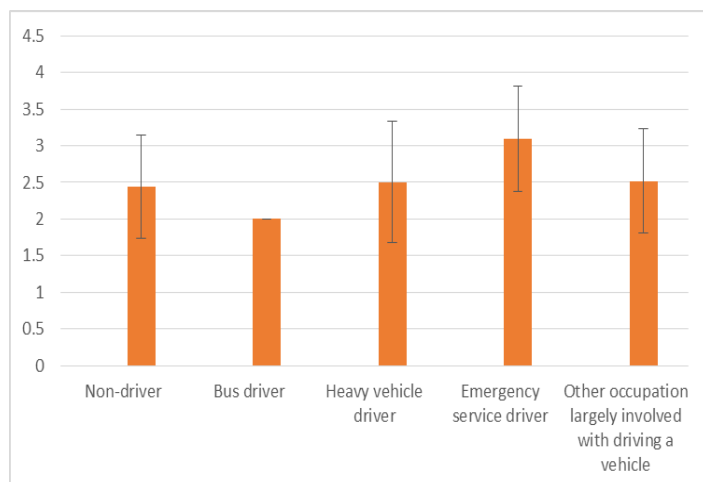
Figure 5.4: Perceived significance of the driver headspace issue (Y-axis represents percentage of participants)



Source: ARRB Group.

- Emergency service drivers** perceive driver headspace as the most significant issue (higher Y-axis ratings indicate stronger agreement) (Figure 5.5).

Figure 5.5: Perceived significance of the driver headspace issue across driving groups

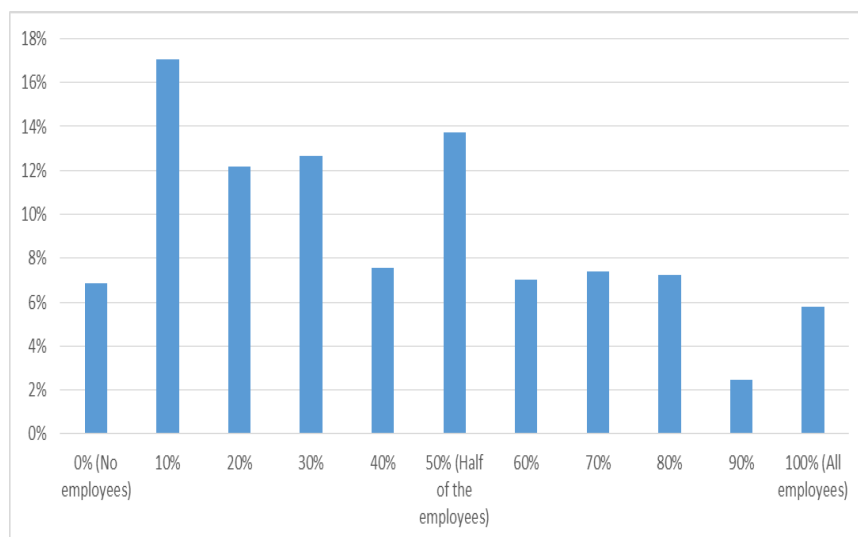


Source: ARRB Group.

Question 4 – What percentage of workers in your organisation would you estimate to have been previously affected by a driver headspace issue during their employment?

- Most participants (17%) estimate that 10% of workers within their organisation have previously been affected by a driver headspace event during their employment (Figure 5.6).
- On average (across different work positions), it is estimated that approximately 41% of workers have been previously affected by a driver headspace issue during their employment (Figure 5.6).

Figure 5.6: Estimated prevalence of driver headspace issue among workers (Y-axis represents percentage of participants)

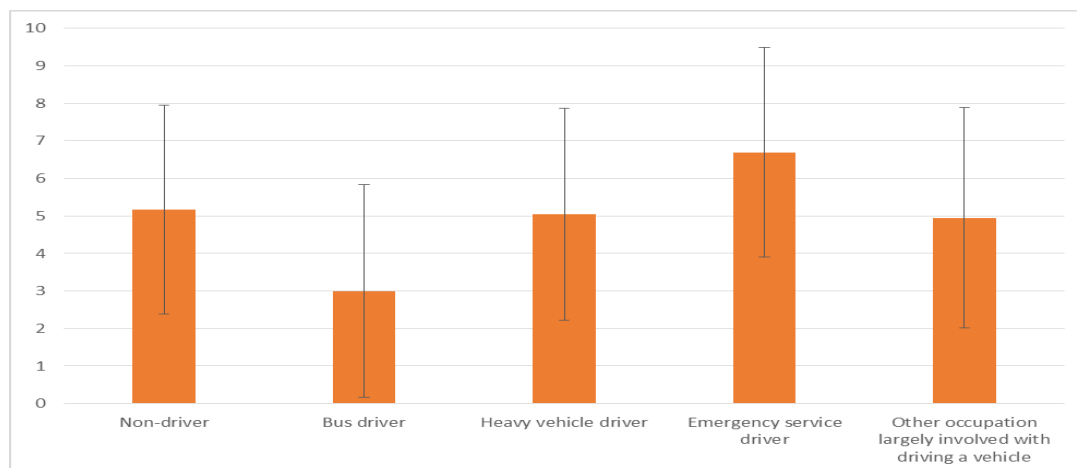


Source: ARRB Group.

- Emergency service drivers** displayed the highest estimated prevalence of driver headspace (Figure 5.7) (higher Y-axis ratings indicate higher estimates of prevalence within the organisation).



Figure 5.7: Estimated prevalence of driver headspace issue across work positions

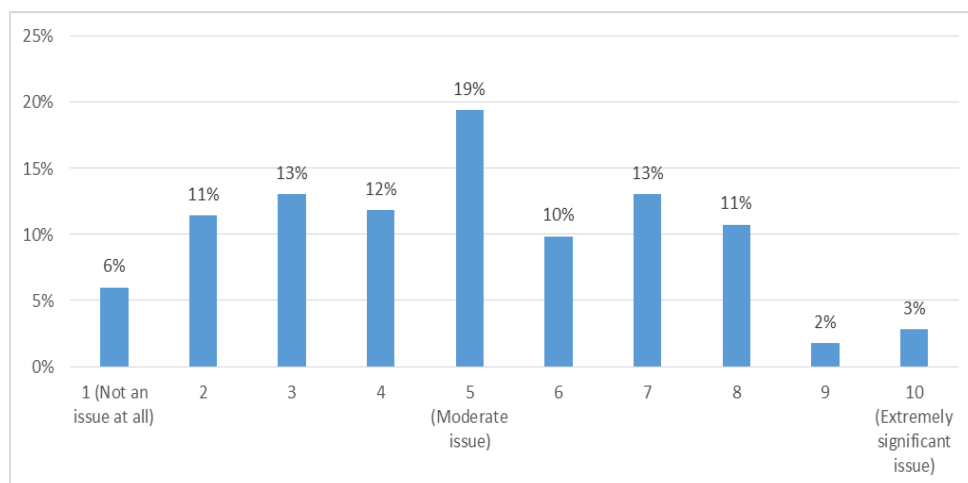


Source: ARRB Group.

Question 5 – On a scale of 1–10, how big of an issue do you think driver headspace is in your particular organisation/workplace? (1 = not an issue at all, 5 = moderate issue, 10 = extremely big issue).

- Most participants (~20%) perceive driver headspace as a **moderate** issue in their particular workplace; 94% of participants feel driver headspace is an issue within their organisation (Figure 5.8).

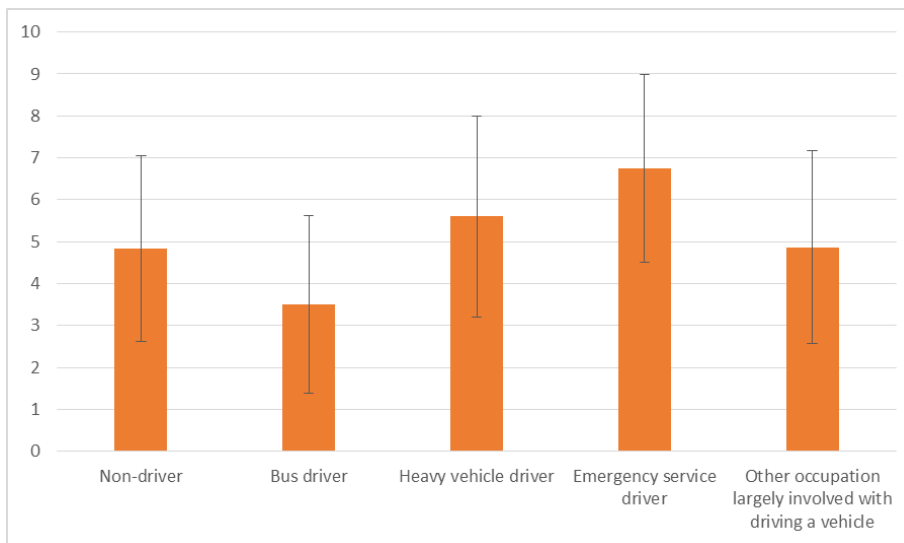
Figure 5.8: Perceived size of driver headspace issue (Y-axis represents percentage of participants)



Source: ARRB Group.

- Emergency service drivers** and **heavy vehicle drivers** were the vehicle groups that perceived driver headspace as the most significant issue (Figure 5.9) (higher Y-axis ratings indicate greater issue).

Figure 5.9: Perceived issue of driver headspace across work positions

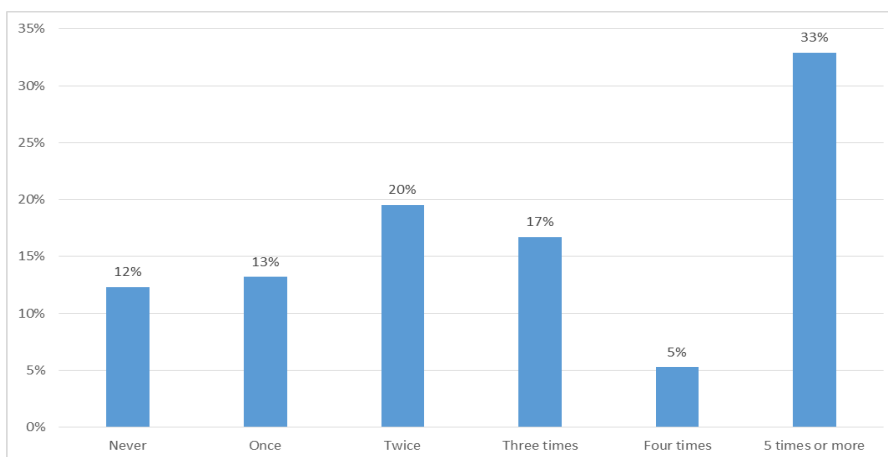


Source: ARRB Group.

Question 6 – How many times would you estimate to have been affected by a driver headspace issue in your current or past employment?

- 33% of individuals estimate that they have been affected by a driver headspace issue in their employment **five times or more**.

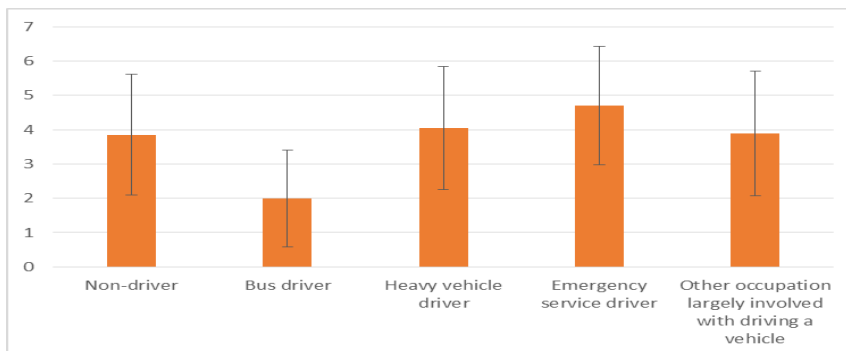
Figure 5.10: Instances affected by a driver headspace event (Y-axis represents percentage of participants)



Source: ARRB Group.

- Emergency service drivers** report having been affected by driver headspace events the most times (Figure 5.11) (Y-axis represents number of instances being affected).

Figure 5.11: Instances affected by a driver headspace event across work positions

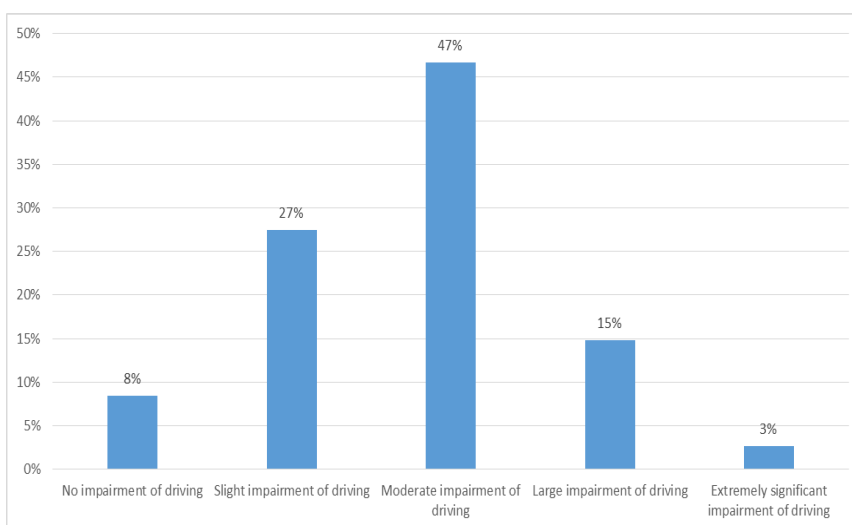


Source: ARRB Group.

Question 7 – In instances that you may have experienced a driver headspace event while driving, how much do you think it has impaired your ability to drive safely?

- 47% of individuals feel that the experience of a driver headspace event has ***moderately impaired*** their ability to driver safely. (Figure 5.12).

Figure 5.12: Driver headspace and impaired driving ability (Y-axis represents percentage of participants)

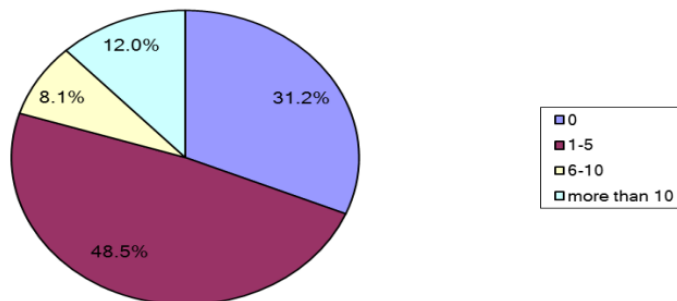


Source: ARRB Group.

Question 8 - How many others in your organisation/workplace do you know (or know of) have experienced a driver headspace event?

- 48.5% of participants know of between 1 and 5 others that have experienced a driver headspace event within their respective organisation (Figure 5.13).

Figure 5.13: Knowledge of others that have experienced a driver headspace event

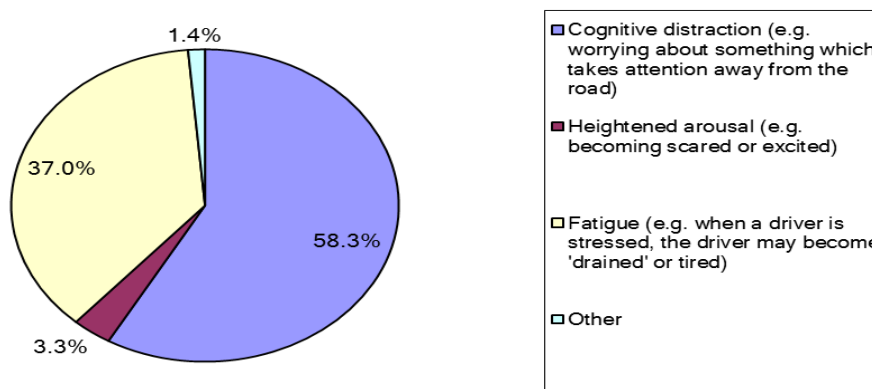


Source: ARRB Group.

Question 10 – Out of the following options, which do you think is the most relevant mechanism by which driver headspace events may impact on an individual's driving performance?

- Almost 60% of individuals perceive **cognitive distraction** as being the most relevant mechanism by which driver headspace events may impact on driving safety. Heightened arousal was perceived as the least relevant mechanism (Figure 5.14).

Figure 5.14: Perceived mechanisms of driver headspace

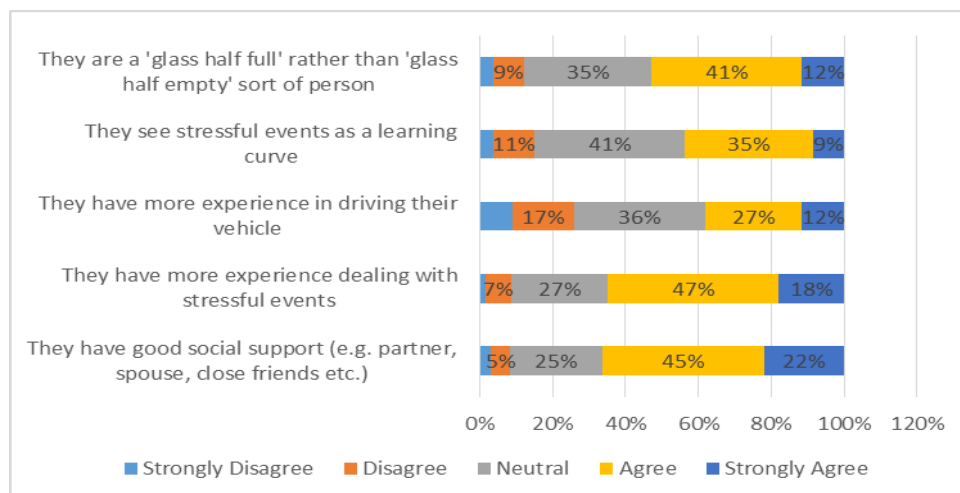


Source: ARRB Group.

Question 11 – Why do you think some people are better able to handle driver headspace events than others?

- Participants perceive that having **more experience dealing with stressful events** and a **good social support network** are the most important characteristics that allow some individuals to handle driver headspace events better than others (Figure 5.15).
- Participants feel that **having more experience in driving their vehicle** was the least important factor in this regard (Figure 5.15).

Figure 5.15: Individual differences and driver headspace

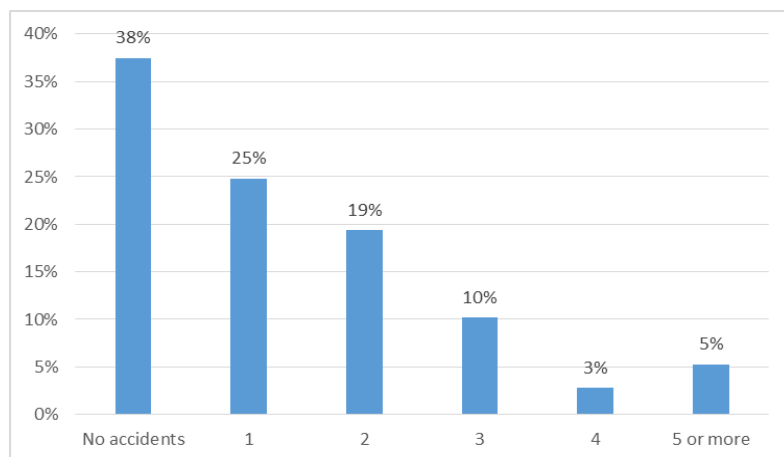


Source: ARRB Group.

Question 12 – How many accidents or near-accidents have you had that you think may have been attributed to a driver headspace event?

- 61.5% of individuals have had one or more accidents or near-accidents that they feel has been due to a driver headspace event (Figure 5.16).

Figure 5.16: Safety critical events due to driver headspace (Y-axis represents percentage of participants)

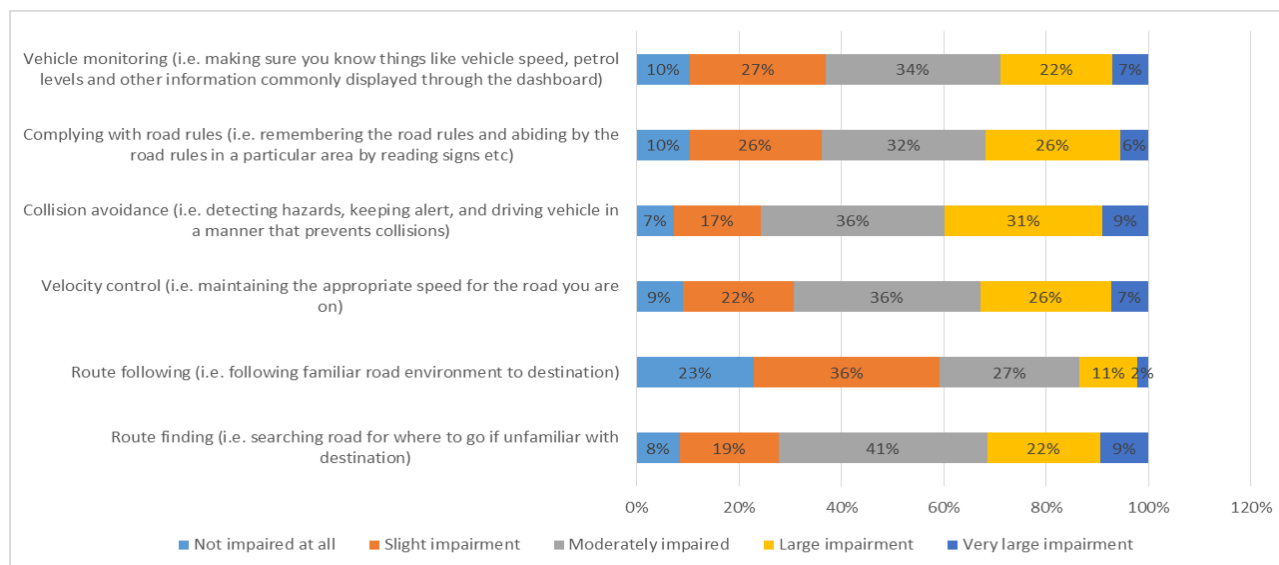


Source: ARRB Group

Question 13 – What functions of driving do you think are impaired by driver headspace events?

- Participants expect that **collision avoidance** is the most prominent driving function that would be impaired when a driver is experiencing a driver headspace event. Participants feel that **route following** would be the most unlikely to be degraded due to a driver headspace event (Figure 5.17).

Figure 5.17: Functions of driving (Brown 1986) by level of impairment from driver headspace events

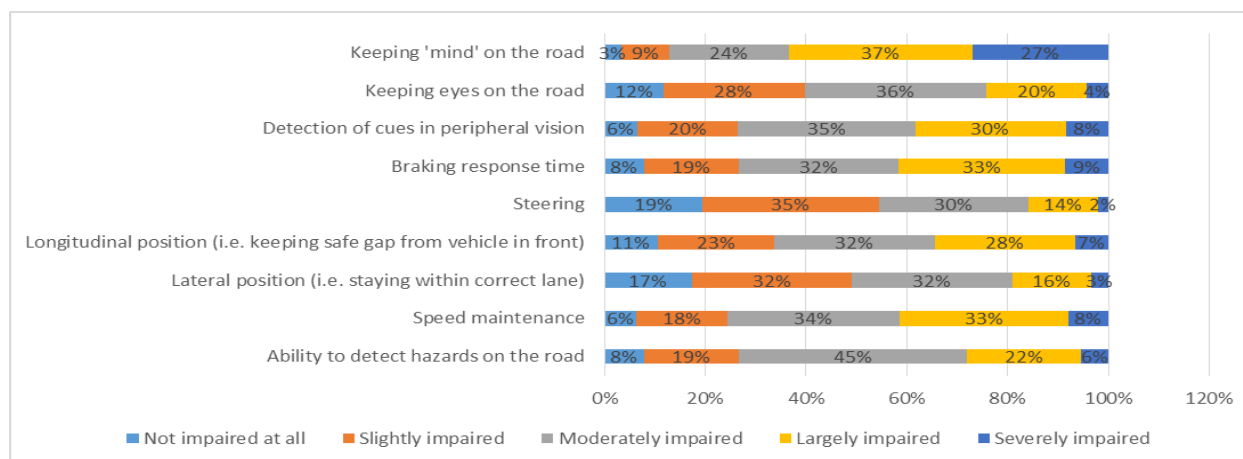


Source: Brown 1986; ARRB Group

Question 14 – What aspects of driving performance do you feel are affected by the experience of a driver headspace event?

- **Keeping 'mind' on the road, braking response time and speed maintenance** are viewed as aspects of driving that will be especially impaired during a driver headspace event (Figure 5.18).

Figure 5.18: Specific driving behaviours by level of impairment from driver headspace events



Source: ARRB Group.

## 6 DISCUSSION AND CONCLUSION

### 6.1 Discussion

#### 6.1.1 Summary of Main Findings

The aim of this study was to carry out research in order to define, shed light on, and increase understanding of the term 'driver headspace'. The seven aims of the research are to:

1. identify and categorise sources of driver headspace events
2. understand the prevalence of driver headspace events across different sectors
3. understand the mechanisms by which driver headspace is impacted
4. understand individual differences in the ability to experience and endure driver headspace events
5. understand a number of strategies that drivers do, and could, use to deal with driver headspace events
6. understand the impact of driver headspace events on driver behaviour and performance
7. identify strategies and organisational policies for preventing and mitigating the effects of driver exposure to driver headspace events.

The following are the main findings that emerged from this study, based on information gleaned from the literature review, focus group, outputs from the driver headspace workshop held at the DDI Conference, and data from a large online survey.

#### *Sources of driver headspace events*

- Literature review: Headspace events can derive from a myriad of negative and stressful events/circumstances. Headspace events can be categorised as follows:
  - Headspace events within the workplace:
    - traumatic (e.g. a paramedic witnessing a critical accident scene)
    - non-traumatic (e.g. tight deadlines at work)
  - Headspace events outside the workplace ('life stress'):
    - e.g. conflicts with spouse, financial issues.
- Focus group: Headspace events can be both positive (e.g. excited about seeing someone) and negative (e.g. stress-related).
- DDI 2015 Conference: Periods of low workload and stress (e.g. a firefighter waiting to be called to a scene) may also negatively impact the mindset of a driver.
- Survey: The main events/circumstances that may negatively impact driver mindset include workplace pressures, fatigue (e.g. exhaustion), and conflicts with family/friends.

#### *Prevalence of driver headspace events across different sectors*

- Literature review: There is a high prevalence of workplace stressors across different professional driving work positions (e.g. bus and truck drivers) that have the potential to negatively impact driver mindset (e.g. shift work and sleep deprivation). The high prevalence of mental health issues among such individuals further supports this notion.



- Focus group: For the two organisations sampled, there is a reportedly high prevalence of workplace stressors and complaints of life stress among security guards and council workers, which have the potential to negatively impact driver mindset and driving safety.
- DDI 2015 Conference: Truck drivers, police officers and other emergency workers are all exposed to a high number of work-related stressors which have the potential to negatively impact driver mindset.
- Survey: Approximately one-third of participants note that their driver mindset has been negatively affected by a stressful or adverse event/circumstance five times or more within their respective organisations.

*Mechanisms by which driver headspace is negatively impacted*

- Literature review: Cognitive distraction (i.e. diverting attention away from the driving task toward an internal stimulus or thought), mental fatigue (e.g. exhaustion, burnout) and physiological responses to stress (e.g. impaired peripheral vision) are potential mechanisms that can explain how stressful and adverse events may negatively impact on driver mindset.
- Focus group: Cognitive distraction was perceived as being the primary mechanism by which stressful and adverse events may negatively impact on driver mindset. Fatigue was believed to be the most relevant mechanism for drivers that work nights and undertake shift work.
- DDI 2015 Conference: In addition to cognitive distraction and mental fatigue, it was suggested that periods of very low workload or stress (e.g. a firefighter waiting for a call to a scene) may also impact negatively on driver mindset when such individuals are required to suddenly attend to a critical or emergency event.
- Survey: Participants reportedly believe that cognitive distraction and fatigue are the primary mechanisms by which stressful events may negatively impact on driver mindset.

*Understand individual differences in the ability to experience and endure driver headspace events*

- Literature review: Personality features (e.g. locus of control, hardiness, neuroticism, optimism) and level (and quality) of social support are well-cited individual differences that dictate how well a person can deal with stressful and negative events (and therefore the level of impact on their psychological state and driver mindset).
- Focus group: The ability to suppress negative thoughts and feelings (as to not interfere with driving) and a high level of visual-spatial ability (i.e. knowing the driving environment one is in) are perceived as important individual differences in this regard.
- DDI 2015 Conference: The ability to compartmentalise (e.g. 'bottle up' negative thoughts so as to focus on driving) is perceived as an important individual difference in this regard, especially among paramedics.
- Survey: A high level of social support and experience dealing with stressful circumstances are reported by participants as the most important individual differences in this regard.

*Strategies that drivers do, and could, use to deal with driver headspace events*

- Literature review: When experiencing a stressful event or negative circumstance, an individual will typically attempt to regulate (reduce) it through a number of strategies, including situational selection, attentional deployment and cognitive appraisal. Knowledge and experience in mindfulness techniques have also been shown to be associated with reduced stress and improved driving performance. Workers may also consult their organisation's EAPs to help relieve stress and other mental health issues.

- Focus group: Attentional deployment (e.g. thinking about 'happy' thoughts) and cognitive appraisal ('seeing glass half full instead of half empty') are perceived to be strategies used by security and council drivers. EAPs and other counselling services are also commonly used. Seeking online resources regarding mental health information is also a nominated strategy that individuals use when dealing with stress.
- DDI 2015 Conference: Attempting to suppress and compartmentalise stressful thoughts and feelings is a prominent strategy for dealing with stress while driving.

#### *Impact of driver headspace events on driver behaviour and performance*

- Literature review: A number of studies have found links between life stress (e.g. financial issues) and increased crash and accident risk. Experimental studies have also found a number of driving impairments associated with mental health issues such as depression and anxiety, including attentional lapses and poorer reaction times.
- Focus group: It is noted that stressed drivers commonly report impairments in concentration and focus on the driving task, impaired detection of important road-related cues, loss of situational awareness, and impaired judgement of vehicle speed.
- DDI 2015 Conference: Inattention blindness is noted as the primary impairment in driving due to the experience of stress. This is attributed to cognitive distraction.
- Survey: Participants perceive that stressful and adverse events impact and impair a driver's ability to keep their 'mind' on the road, and degrades collision avoidance.

#### *Identify strategies and organisation policies for preventing and mitigating the effects of driver exposure to driver headspace events*

- Literature review: In general, six strategies are offered to reduce prevalence of stressful circumstances and help mitigate mental health issues within the workplace:
  - designing and managing work to minimise harm
  - promoting protective factors at an organisational level to maximise resilience
  - enhancing personal resilience
  - promoting and facilitating early help-seeking
  - supporting worker recovery from mental illness
  - increasing awareness of mental illness and reducing stigma.
- Focus group: Offering EAPs and reducing stigma within the workplace to promote help-seeking behaviour are perceived as important strategies for organisations to address the potential negative impacts of work-related stress on driver mindset. Promotion and participation in mental health awareness campaigns (e.g. R U OK? Day) are also regarded as important strategies in this respect.
- DDI 2015 Conference: EAPs and counselling are crucial for emergency workers due to high exposure to stressful and potentially traumatic circumstances. A number of strategies specific to long-haul truck drivers were also offered, such as proper facilities for rest to mitigate against fatigue, and reduced interaction with customers (to prevent demands and abuse relayed to drivers during their journey, which may negatively impact the driver's mindset).

### 6.1.2 Limitations

The findings of the present study must be viewed in light of a number of limitations:

- The lack of a clear scientific definition of 'driver headspace' means that we have had to make educated decisions regarding what constructs it might encompass (e.g. stress, cognitive distraction).
- We were unable to obtain a larger sample for our focus group. This was probably due to a lack of reimbursement offered for participation, and/or participants being unable to attend during normal working hours.
- The survey used in the study has some limitations: (a) it was not psychometrically validated in the sense that the questions had not been pilot tested previously, nor had they been tested on different populations; (b) the sample employed was not representative of the Australian population, although this is not considered a significant issue, as the focus of the present study was to explore driver headspace primarily in work-related drivers; and (c) as previously noted, inferential statistical analyses were not appropriate to perform on the data collected, as sample sizes between groups differed and some groups had only two participants (e.g. taxi drivers). However, descriptive statistical analyses could be, and were, performed on these data (e.g. examining means and averages between groups of drivers, etc.)

### 6.1.3 Future Research

The present study offers a number of fruitful avenues for future research:

- As suggested by the literature review, more research is required to define the construct of 'driver headspace' more succinctly as to allow it to be better operationalised in future experiments and studies.
- Focused research within selected organisations where their workers spend a significant period on the road and for which driver headspace events may be especially relevant and prominent. Future research should employ a sample of workers and managers from larger organisations to gauge their opinions and views of the driver headspace issue. In addition, targeting individuals in management positions may provide more information regarding prevention and mitigation strategies (if any) that may be in place within their respective organisations.
- The survey should be refined and validated to allow for the use of inferential statistics (e.g. testing differences between driving groups or between professional drivers and non-professional drivers on 'driver headspace'-related constructs).
- There is a lack of applied experimental research looking at how traumatic and high stress events *actually* impact on driver headspace and driving safety. Ideally, such research would require a small-scale naturalistic driving study in which, for example, emergency worker vehicles (e.g. police cars, ambulances) are equipped with equipment to observe and record how driving behaviour, performance and psycho-physiological state (e.g. heart rate, respiration rates) are affected as a result of exposure to headspace events. Emergency services vehicles are desirable given that individuals in this work position reported the highest prevalence of headspace events.

## 6.2 Conclusion

Driver headspace is an abstract concept that has been coined to describe changes in a driver's state of mind or mindset resulting from exposure to a stressful event or adverse circumstances.

A review of the literature reveals no scientific reference to the term 'driver headspace'; or to changes in driver headspace, per se, resulting from driver exposure to a stressful event or adverse circumstances.

What the literature does reveal is that exposure to a stressful event or adverse circumstance can have negative impacts on psycho-physiological functioning and, in turn, on driver performance and safety. However, people have been found to respond to such events and circumstances differently, due to different coping strategies and other individual differences.

The literature and the research activities undertaken in this study provide insights into the kinds of stressful events or adverse circumstances that people may be exposed to, and the kinds of impairments in driving performance and safety they are associated with. Exposure to such events and circumstances appears to be prevalent across a number of different sectors in the Australian corporate sector, especially among professions in which driving is an integral part of the job.

A range of strategies and organisational policies exist for preventing and mitigating the effects of driver exposure to stressful events and adverse circumstances. It is recommended that organisations, especially those in which driving is an integral part of the job, be made aware of the individual and corporate strategies that may be used to prevent and mitigate the impact of worker exposure to stressful events or adverse circumstances. However, little is still known about how effective such strategies may actually be for mitigating driver headspace events.

The research undertaken in this study highlights that degraded psycho-physiological functioning brought about by exposure to a stressful event or adverse circumstance is a real and understudied issue. Further research is needed to gain a better understanding of the actual prevalence of 'headspace events', their actual consequences, and effective mechanisms that mitigate the risks.

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## APPENDIX A WORK-RELATED STRESSORS

**Table A 1: Common work-related stressors (i.e. potential sources of driver headspace events) for professional drivers and emergency services workers**

Bus drivers (see Tse, Flin & Mearns 2004)	Heavy vehicle (truck) drivers (see Shattell et al. 2012)	Emergency services workers (see Naude & Rothmann 2003)
Lack of decision-making authority	Long work hours	Poor or inadequate supervision/management
Fatigue	Disrupted sleep patterns and fatigue	Lack of participation in policy-making decisions
Fear of assault	Spending many consecutive days away from home and family	Inadequate support by supervisor/management
Social isolation	Time pressures due to demands of 'just in time' delivery requirements	Lack of recognition
Tight running schedules	Compliance with 'hours of service' driving requirements (drivers in the USA are not permitted to driver more than 14 hours per day)	Inadequate salary
Vehicle mechanical faults	Low job satisfaction and control	Poorly motivated co-workers
Reduced rest breaks		Difficulty getting along with supervisor/management
Poor cabin comfort		Lack of specialised personnel
Continually rotating shift patterns		Lack of opportunity for advancement
Adverse weather conditions		Performing tasks not in job description
Traffic congestion		Insufficient personnel to handle workload
The sedentary nature of the job		Budgetary constraints
Noxious air from other vehicles		Negative attitudes towards organisation/ emergency services
Pressures of ensuring safety of passengers		Frequent changes from boring to demanding activities
Demanding passengers		Critical on-the-spot decisions
		Experiencing new/unfamiliar emergency situations
		Work area dependent on emergency situation
		Performing duties in dangerous situations
		Frequent interruptions
		Dealing with crisis situations
		Negative attitudes of other health care personnel towards emergency services
		Conflicts with other departments/health care providers
		Dealing with other health care professionals
		Unnecessary call-out and public abuse
		Security risk in terms of emergency geographical location

Bus drivers (see Tse, Flin & Mearns 2004)	Heavy vehicle (truck) drivers (see Shattell et al. 2012)	Emergency services workers (see Naude & Rothmann 2003)
		Dealing with difficult customers/patients
		Constant public and traumatised relative scrutiny at emergency scene

## APPENDIX B SHORT STRESS SURVEY

### Self-Scoring Stress Test

Choose a number for each statement and add up your own score.

Behaviour	almost always (2 points)	a few times a week (1 point)	rarely (0 points)
I feel tense, anxious or have nervous indigestion.			
I seem to be low in energy.			
I eat/drink/smoke in response to tension.			
I have tension or migraine headaches, or pain in the neck or shoulders.			
I seem to have trouble getting to sleep naturally or have difficulty getting back to sleep if awakened.			
I find it difficult to concentrate on what I'm doing because of worrying about other things.			
I take pills, medicine, alcohol or other drugs to relax.			
I have difficulty finding enough time to relax.			
If I finally find the time, it is hard for me to relax.			
I feel pressured during my workday.			
I find it difficult to laugh.			

Maximum total score = 22

MY TOTAL SCORE = \_\_\_\_\_

Score	Tension level
14-22	Considerably above average
10-13	Above average
6-9	Average
3-5	Below average
0-2	Considerably below average

If you're above average, it's vital for you to develop a coping plan. And if you're doing fine at the moment, a good coping plan will help you stay fine (Canadian Mental Health Association, n.d.).

## APPENDIX C PARTICIPANT INFORMATION AND CONSENT FORM

### C.1 Participant Information and Consent Sheet

Dear participant,

You have been invited to participate in a study exploring how driver headspace events may impact on an individual's ability to drive safely.

This study is being conducted by:

- Mitchell Cunningham (p: +61 2 9282 4411, e: Mitchell.cunningham@arrb.com.au)
- Adj. Prof. Michael Regan (p: +61 2 9282 4402, e: Michael.Regan@arrb.com.au)

Before deciding whether or not you wish to participate in this study, it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully and discuss it with others if you wish.

If you agree to participate in this study, you will be asked to sign your consent on the following page.

#### ***What is the purpose of this study?***

The purpose of this study is to highlight how stressful or adverse events may negatively impact on a driver's driver headspace (or mindset) and, in turn, impair their ability to drive a vehicle (e.g. car, taxi, truck, bus) safely. For example, a driver may be stressing about something, have personal concerns or worries, or may have just witnessed a traumatic event, which may impair their ability to drive safely.

#### ***What will the study involve?***

If you decide to participate, you will be asked questions to gauge your opinions on and experience with the driver headspace issue. The discussion will be voice-recorded only.

#### ***Are there some risks in me taking part in this study?***

As this focus group will ask you to reflect on your thoughts and experiences on driver headspace issues (i.e. stressful or adverse events), there is a low risk of causing some discomfort. In such an event, you are encouraged to contact Lifeline (p: 131114), a free and anonymous telephone counselling service. Also, This Way Up (<https://thiswayup.org.au/>) is a Sydney-based clinic that offers both face-to-face and an online clinic specialising in anxiety concerns. ARRB's Employee Assistance Program is also available for anonymous consultation (details will be given upon commencement of focus group).

#### ***Will I benefit from this study?***

You may not directly benefit from the study. However, results from this research may help address this understudied topic of driver safety.

#### ***What if I want to withdraw from the study?***

Participation is voluntary and you have the right to withdraw from further participation at any time (after which your responses will be removed).



***What happens with the results?***

Data will be aggregated and may be published in industry research reports or presented at conferences or similar forums. No individual responses will be identified in the reporting of these results. A short summary of the aims and findings of the research will be made available upon request (contact Mitchell).

All data and results are stored in both locked cabinets and password-locked computers. All data will only be accessible by the lead researchers and will be destroyed upon conclusion of the research.

Thank you for taking the time to consider this study. If you have read the above information and you wish to take part in the focus group, please sign the consent below.

Yours sincerely



**Mitchell Cunningham**  
Graduate Behavioural Scientist

Your signature below indicates that you have understood the information about this study and consent to your participation. The participation is voluntary and you may refuse to answer certain questions in the focus group and withdraw from the study at any time with no penalty. This does not waive your legal rights. If you have further questions related to this research, please contact Mitchell Cunningham.

\_\_\_\_\_  
Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Researcher

\_\_\_\_\_  
Date

## APPENDIX D      FOCUS GROUP QUESTIONS

### **1. *What is driver headspace?***

Can you tell us, in your own words, what does driver headspace mean to you? How would you define it?

### **2. *Sources of headspace***

Can you tell us what events or situations have or may lead to negatively impacted driver headspace within your organisation?

### **3. *Prevalence of headspace***

How big a problem is driver headspace in your organisation?

### **4. *Mechanisms of headspace***

What do you think are the mechanisms of driver headspace? For example, is headspace simply cognitive distraction? Or is it heightened arousal?

How do headspace events affect you? Do you know how it has affected others?

### **5. *Individual differences of headspace***

Do you think some people are better able than others to handle driver headspace events? If so, why? What factors do you think play a role?

### **6. *Strategies to reduce headspace***

What strategies have you used, or have other people you know used, to deal with the effects of driver headspace events?

### **7. *Impact of headspace events on driving***

How have driver headspace events affected you when you have been driving (both inside and outside of work)?

How has your driving been affected?

Have you had any accidents or near-accidents that you think may be attributed to driver headspace?

Are there any other issues you'd like to raise, that may not have been covered today, that relate to driver headspace?

## APPENDIX E SURVEY QUESTIONS

- \* 12. A 'headspace' event may be an adverse or stressful event that may negatively impact on one's driving performance and safety. For us, an example may be of an individual that is stressed out by tight deadlines at work and so they worry or dwell over it while driving to and from work, potentially taking their focus away from the driving itself.

Do you agree with this definition of a 'headspace' event you have just read?

☒ Yes

☐ No

If 'No', briefly describe how you'd define a 'headspace' event?

- \* 13. The issue of 'headspace' is a significant issue in your organisation

Strongly Disagree	Disagree	Agree	Strongly Agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- \* 14. In instances that you may have experienced a 'headspace' event while driving, how much do you think it has impaired your ability to drive safely?

No impairment of driving	Moderate impairment of driving	Significant impairment of driving
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- \* 15. What events or situations have led or may lead to 'headspace' events (that may, in turn, impair driving performance) within your organisation? (Choose all that apply)

- ☐ Fatigue (i.e. exhaustion, burnout)
- ☐ Sleep deprivation
- ☐ Pressures within the workplace (e.g. conflicts with colleagues, deadlines etc.)
- ☐ Viewing a traumatic or distressful event
- ☐ Personal conflicts with family or friends
- ☐ Abuse or threatening events when doing job

Other (please specify)

- \* 16. What percentage of employees in your organisation would you estimate to have been previously affected by a 'headspace' issue during their employment?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 17. How many others in your organisation/workplace do you know (or know of) that have experienced a 'headspace' event?

- ☐ 0
- ☐ 1-5
- ☐ 6-10
- ☐ more than 10

\* 18. Out of the following options, which do you think is the most relevant mechanism by which 'headspace' events may impact on an individual's driving performance?

- ☐ Cognitive distraction (e.g. worrying about something which takes attention away from the road)
- ☐ Heightened arousal (e.g. becoming scared or excited)
- ☐ Fatigue (e.g. when a driver is stressed, the driver may become 'drained' or tired)
- ☐ Other

Other (please specify)

\* 19. How many times would you estimate to have been affected by a 'headspace' issue in your current or past employment?

Never	Once	Twice	Three times	Four times	5 times or more
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 20. On a scale of 1-10, how big of an issue do you think 'headspace' is in your particular organisation/workplace? (1 = not an issue at all, 5 = moderate issue, 10 = extremely big issue)

1	2	3	4	5	6	7	8	9	10
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 21. Why do you think some people are better able to handle 'headspace' events than others?

	Strongly Disagree		Neutral		Strongly Agree
They have good social support (e.g. partner, spouse, close friends etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
They have more experience dealing with stressful events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
They have more experience in driving their vehicle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
They see stressful events as a learning curve	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
They are a 'glass half full' rather than 'glass half empty' sort of person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 22. How many accidents or near-accidents have you had that you think may have been attributed to a 'headspace' event?

None	1	2	3	4	5+
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 23. What aspects of driving performance do you feel are most affected by the experience of a 'headspace' event?

	Not impaired at all		Moderately impaired		Severely impaired
Ability to detect hazards on the road	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speed maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lateral position (i.e. staying within correct lane)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Longitudinal position (i.e. keeping safe gap from vehicle in front)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Steering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Braking response time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Detection of cues in peripheral vision	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Keeping eyes on the road	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Keeping 'mind' on the road	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

24. What functions of driving do you think are impaired by 'headspace' events?

	Not impaired at all		Moderately impaired		Strongly impaired
Route finding (i.e. searching road for where to go if unfamiliar with destination)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Route following (i.e. following familiar road environment to destination)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Velocity control (i.e. maintaining the appropriate speed for the road you are on)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collision avoidance (i.e. detecting hazards, keeping alert, and driving vehicle in a manner that prevents collisions)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complying with road rules (i.e. remembering the road rules and abiding by the road rules in a particular area by reading signs etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vehicle monitoring (i.e. making sure you know things like vehicle speed, petrol levels and other information commonly displayed through the dashboard)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>