

Cognitive behavioural therapy (CBT)

An evaluation of CBT for the treatment of riding-related stress



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The IAM (Institute of Advanced Motorists) is the UK's largest independent road safety charity, dedicated to improving standards and safety in driving, motorcycling and cycling. Best known for the advanced test the IAM has more than 90,000 members and is supported by a local volunteer network of 200 groups in the UK and Ireland. We provide driver risk management solutions to businesses through our commercial arm, IAM Drive & Survive, and driver retraining through IAM Driver Retraining Academy.

The IAM's policy and research division offers advice and expertise on road safety, and publishes original research on road safety issues.

Introduction

Motorcyclists continue to account for disproportionately more casualties than would be expected given the distance they travel. In 2014 motorcycle traffic increased by 3 per cent on the previous year but the number of seriously injured casualties increased by 9 per cent to 5,289, outstripping the increase in use.

This innovative new research centres on the potential impact of cognitive behaviour therapy (CBT) for motorcyclists who may feel stressed on the UK's busy roads. It is well known that mental health can have a direct effect on your driving and riding and recognising trigger points for anxiety, stress and road rage is an important first step to doing something about it. CBT then offers workable solutions to calm people down and avoid conflicts.

This report shows some very positive early results and also gives some clear indicators of where further research may be beneficial.





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Right mind, right ride: an exploration of cognitive behavioural therapy (CBT) for the treatment of riding-related stress

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Executive Summary

Stress can emerge from different areas of life but its effects on well-being are well established and can range from transitional mood swings to more damaging mental health issues such as depression. Moreover, research shows that stress while driving can influence driving performance and may increase risk to drivers and riders. For example, Rowden, Matthews, Watson and Biggs (2011) showed that associations have been found between stress and crash involvement.

Cognitive behavioural therapy (CBT¹) is a well-established, evidence-based intervention for people suffering from a number of psychological conditions and emotional difficulties. Recently, research has also shown that CBT may also be beneficial in reducing risk for drivers suffering from anger, anxiety and stress (Najeeb, 2008; Strom et al., 2013).

The purpose of this research was to evaluate the effectiveness of brief CBT (a six week, focused form of CBT) for the treatment of rider (motorcyclist) stress and stress-related anxiety or worry. Riders are an important group as lapses in attention and risky behaviours, regardless of causality, increase risk for an already vulnerable road user group. According to recent statistics by the DfT, motorcyclists represent less than 1% of road traffic, but 19% of all traffic collisions (DfT, 2014). In addition, riders may be subject to various additional stressors when on the road, for example bad weather, slippery/uneven surfaces, or issues with shared road space and other road users are specific concerns that can increase feelings of anxiety, stress and anger for a motorcyclist.

The present research employed quantitative and qualitative data collection methods. A total of seven participants completed two previously validated self-report questionnaires, the Drivers Stress Inventory (DSI) and the Driver Behaviour Questionnaire (DBQ), at two different time points: before undertaking CBT and 1-3 weeks after the end of the programme. Throughout the six weeks of intervention, participants also completed a weekly rider log where they reported examples of incidents that served as stress 'triggers' as well as how these were managed. Two participants dropped out after two sessions, leaving the final sample with five participants.

Quantitative findings from the DSI and DBQ showed positive trends in the overall reduction of rider stress traits, such as aggression, thrill seeking, and dislike of riding. The results also showed that hazard monitoring, a 'protective' trait which reflects a positive coping style, was also improved after participants undertook the intervention. DBQ data supports these findings as riders were also generally found to have lower DBQ scores after the intervention.

Qualitative data showed that participants engaged well with the intervention and believed it had aided them in their riding-related problems; they also felt it had helped them improve on other areas of life, such as achieving healthier lifestyles as well as coping better with work-related stress.

¹ The authors are aware that CBT in a motorcycling context is more typically used as an abbreviation for the compulsory basic training programme required of all learner riders. However, in this report, CBT is used exclusively to refer to cognitive behavioural therapy.

Rider logs also showed improvements week-on-week. Some participants provided evidence of short-term changes in coping with stressful situations when on the road. The logs showed that towards the beginning of the intervention (around Session 2) participants were struggling with feelings of anxiety and anger toward other drivers who made mistakes while on the road. However, towards the end of the therapy (around Session 5), participants started to exhibit more positive cognitions towards other road users. They also reported feeling more calm and in control when faced with difficult situations.

Overall, the results of this small-scale evaluation are promising. The results of this work provide some initial evidence of the effectiveness of CBT for the treatment of rider stress in a sample of motorcyclists.

The study has a number of strengths. It builds on previous research relating to CBT and road safety as it provided a structured evaluation of the intervention and employed previously validated scales which have been used in similar research. In addition, the sample included a good range of participants (including one female), who reported varied sources of stress and riding behaviours; these participants were also screened for existing psychological conditions (and previous treatment) which could have biased the results of the study.

However, the scale and scope of the present work mean that there were also a number of limitations. Firstly, the small sample size means that results from this work should be considered with caution, and within the context of this and other research limitations. Second, the lack of a control group precludes the understanding of the effects of CBT when compared to other interventions (such as skills-based programmes) or life changes, unrelated to the intervention. However, research by Matthews and colleagues stresses the importance of individual characteristics in mediating the effects of stress on road safety; hence, CBT provides riders with a level of individuality that can account for personality characteristics or life events in a way that general skills-based training (or similar interventions) cannot achieve.

As a result of this research it is recommended that a large-scale evaluation of CBT for rider stress is undertaken and similar investigations in relation to the use of CBT in supporting other vehicle operators are advised.

1 Background

1.1 Stress

For some time stress has remained a prominent topic in relation to health and safety in the UK and worldwide. Stress can emerge from different areas of life but its effects on well-being are well established, and can range from transitional mood swings to more damaging mental health issues such as depression (Turner, Wheaton & Lloyd, 1995; Tennant, 2001).

Moreover, the effects of stress go beyond the individual; people who suffer from stress have been shown to incur higher health-care expenditures, increased absenteeism, and decreased work productivity (Cox, Griffiths, Rial-González, 2000). Similarly, an HSE report showed that occupational stress can cost Great Britain in excess of £530 million (HSE, 2007).

Hence, the negative effects of stress at a personal and societal level are real and widespread. As stress continues to affect people's personal and work lives, it is also likely to have knock-on effects on other areas of life, such as road safety.

1.2 Stress and road safety

Driving is a complex task that requires many cognitive and attentional resources. Strain on these resources can result in reduced performance and, in some cases, increased risk.

Stress can affect essential driving skills by dividing attention, affecting concentration and by placing additional demands on the road user. However, heightened stress does not always result in a decreased driving performance; sometimes the impact of stress on road safety is mediated by personality characteristics that increase vulnerability to stress (Matthews, 2002). Under certain circumstances, this combination of personality and life factors can result in an interpretation of (and reaction to) road traffic events that reflects the road users' own concerns and cognitive biases.

Although both sources of stress have been shown to have a negative impact on road safety (e.g. Rowden et al., 2011; Matthews, Dorn, Hoyes, Davies, Glendon & Taylor, 1998), they are sometimes treated separately within the research literature.

Previous research (i.e. Hill & Boyle, 2007) classifies the sources of stress as follows:

- State stress – stress that relates to specific situations or events, including driving
- Trait stress – stress from factors or characteristics that reside within the individual

Regardless of the aetiology of stress at the individual level, its effects on road safety are well evidenced and are presented in the subsequent sections.

1.2.1 State stress and driving

Previous research has shown that everyday stress can have an effect on driving performance. A study by Rowden and colleagues (2011), involving a sample of 247 employees aged 22-69 years old, found that stress related to general life hassles (i.e. work-related stress, life, and general mental health) was associated with increases in

driving errors, violations and lapses as measured by the Driver Behaviour Questionnaire (DBQ).

Another study in France using data from a large cohort study showed that life events such as separation/ divorce and a child leaving home were associated with an increase in serious traffic accidents over a period of seven years (Legarde, Chastang, Gueguen, Couret-Pellicer, Chiron & Lafont, 2004).

Similarly, work by Legree, Heffner, Psootka, Martin & Medsker (2003) evaluated stressful environments and psychological characteristics as predictors of driving behaviour (as measured by reported at-fault crash rates) in a sample of 127 enlisted soldiers involved in either personal or work-related vehicle accidents. The results of the research showed that participants who reported heightened stress due to a life event were more likely to be at-fault in a collision. In addition, 'heightened stress' and 'emotional state prior to accident' (stressed versus calm) were found to predict driver at-fault status.

1.2.2 Trait stress and driving

The findings in Section 1.2.1 highlight that the driver state of mind has an impact on crash risk. However, further analysis of the driver data collected by Legree et al. (2003) showed that crash-risk may also be mediated by individual characteristics in emotional awareness and coping skills when confronted with a stressful road situation. Therefore, stresses induced by a combination of life stressors and personal characteristics can also have a negative impact on road safety.

Matthews and colleagues have undertaken extensive research to understand the complex interactions between personality and stress susceptibility and, later, the relation between these personality characteristics and dangerous driving behaviours.

A number of studies have identified that personal characteristics such as aggression, dislike of driving (sometimes defined as anxiety of driving), and thrill-seeking are associated with driving stress. They have also found that these characteristics are related to dangerous behaviours such as reduced control skills, errors during vehicle following and frequent overtaking (Matthews et al., 1998).

Another study with a British sample of over 500 drivers employed a measure of driver stress, the Driver Stress Inventory (DSI), and found that personality traits such as thrill-seeking and aggression were related to higher accident involvement (Matthews et al., 1997). Lower scores (i.e. worse attitudes) in hazard monitoring were also related to crash involvement.

Furthermore, Rowden and colleagues (2011) also showed that characteristics such as thrill-seeking and aggression (as measured by the DSI) were significant predictors of violations on the DBQ. Similarly, dislike of driving was a significant predictor of driver errors and lapses.

1.2.3 Motorcyclists

Little work has been done to date to understand motorcyclists' stress specifically. General work in the area of stress and road safety tends to focus on groups of drivers; this may be due to the higher accessibility to the driver population, or to the fact that research to date has mostly looked into relationships between stress and road traffic events (e.g. errors and violations) that would be common to different types of road users.

One study that specifically looked at stress in relation to risk-taking in motorcyclists was undertaken in Germany by Raithel (2001). The study findings, which were based on a sample of 137 male adolescent motorcyclists between the ages of 16 to 18 years, showed that scholastic pressure was significantly positively correlated with violations of traffic regulations and exposition to traffic risks. However, as this study was undertaken with fairly young and inexperienced riders (on motorcycles with engine capacity up to 80cc), it is difficult to know whether these findings would generalise to other groups of motorcyclists, particularly given the current understanding of adolescent risk-taking and general tendency for higher crash involvement. This said, and in light of previous research, it is reasonable to accept that the effects of stress on road traffic behaviour are visible across road user groups.

Motorcyclists are a particularly important road user group as they represent less than 1% of road traffic but show involvement in 19% of all traffic collisions (DfT, 2014). In addition, due to their increased exposure to the road environment, motorcyclists may be subject to various additional stressors such as bad weather or issues with shared road space that are specific concerns to this road user group.

1.2.4 Summary

The evidence presented shows that stress can have a negative impact on driving performance and, in some cases, it has been linked to increased crash risk. However, stress is a complex state of mind that is often difficult to measure, particularly as it is often transient in nature.

Previous research also highlights that there are some personality characteristics that can increase vulnerability to stress in the driving context. These characteristics have also been found to relate to dangerous driving behaviours such as driving errors and violations which, in turn, have also been associated with crash involvement.

The combination of state and trait stress can therefore help researchers to identify potential ways of helping to improve safety for road users. However, little is currently available to help motorcyclists to manage stress, particularly in relation to road traffic events. Given the extent of the effect of stress on road safety, and the increased vulnerability of motorcyclists to road traffic collisions, it may be useful to develop an intervention that can help riders manage stress in a way that could benefit road safety.

1.3 Developing interventions for stress

To date, few interventions are available to help riders cope with stress, particularly when stress (and reactions to stressful events) is mediated by personality characteristics. Research by authors such as Matthews (2002) suggest that stress can be more damaging to road safety when the road user's cognitive processing is biased, particularly when this results in maladaptive reactions to specific demands. Matthews et al. (1998) also note that there is no single mechanism that links stress to unsafe driving and suggests that the development of practical interventions should seek to understand how individual driver's cognitions, coping strategies, and appraisals vary. This corresponds with findings by research such as Legree and colleagues (2003) which identified that traits such as emotional self-awareness and knowledge can mitigate the adverse effects of emotions on driver safety.

Therefore, an effective intervention should provide motorcyclists with the opportunity to evaluate their own cognitions about road traffic events and conditions and provide them with the tools necessary to cope effectively with stressful road (and life) environments.

1.4 Aim of this study

The purpose of this study was to undertake a short term evaluation of the effectiveness of an intervention, a six week Cognitive Behavioural Therapy (CBT), for motorcyclists who experience riding difficulties due to stress or stress-related anxiety or worry.

2 Cognitive Behavioural Therapy (CBT)

2.1 What is CBT?

Cognitive behavioural therapy is an evidence-based, National Institute for Health and Care Excellence (NICE) recommended talking therapy widely used to help a variety of emotional difficulties. This psychological technique is used to help people identify counter-productive or irrational thinking patterns (which result in maladaptive behaviours) so that these patterns can be replaced with constructive thoughts and beliefs (Najeeb, 2008). During therapy, the client and the therapist work together to change or alter the ways in which the client thinks or behaves, that is more helpful for them.

Since its development in the 1960s, the effectiveness of CBT in treating conditions such as anxiety, depression and anger has been well documented and as such it has been established as a fundamental tool in psychological treatments.

2.1.1 How does it work?

Traditionally, CBT is a structured intervention which involves one-on-one or group work led by a therapist. The role of the therapist is to work together with each individual to identify and break down problems into smaller parts and understand the relationship of these problems with the individual's thoughts, feelings, and behaviours. To achieve this, the therapist meets with the patient or group for between 30 minutes and 2 hours (between five and 20 sessions in total) and together they identify particular issues upon which the individual would like to work in the short, medium and long term. Once the problem has been identified and broken down, the therapist will help the person to understand how to change unhelpful thoughts and provide 'assignments' to help the patient practise.

2.1.2 CBT and road safety

More recently, research has shown that CBT can also be effective in improving the mind-set of car drivers in relation to dangerous road behaviours such as anger (Najeeb, 2008; Strom et al., 2013; Kazemeini, Ghanbari-e-Hashem-Abadi & Safarzadeh, 2013).

A study conducted by Najeeb (2008) investigated the effects of a four day CBT course on driver road safety attitudes on a sample of bus drivers (n=200) ages 35 to 55 in India. CBT methods, mainly cognitive restructuring, were used to target a wide range of non-clinical issues directly related to driving, including: speeding, unrealistic optimism (about drivers own ability) and the management of low expectations of risk in road traffic, risk perception, expectations of the vehicle, and human limitations (including the effects of alcohol and limitations of cognition, attention and perception). The outcome measures included a driver personality questionnaire (driver behaviour) and a driver training assessment scale, which measures attitudinal change toward speeding, driving ability, and risk. Comparison of the control and experimental group after the treatment yielded a significantly difference between groups in safety attitudes of drivers. The therapy was also found to be well received by drivers.

Strom and colleagues also evaluated the use of CBT with a sample of nine male veterans who reported aggressive and risky driving behaviours. Participants took part in eight

group sessions facilitated by two psychologists. Of those completing the treatment, and according to a reliable change criterion (a measure used to define clinically significant change in therapy outcomes with a 'dysfunctional population') generated for the outcome measures, five participant demonstrated a reliable change in risky driving, and four demonstrated reliable change in trait anger. Eight of the nine participants showed high levels of satisfaction with the treatment, and seven reported they would recommend it to a friend (Strom et al., 2013).

A study by Kazemeini and colleagues (2013) compared the effectiveness of MBGBT (mindfulness-based group cognitive therapy) with group CBT on reducing anger and aggression while driving. MBCBT is a technique developed from the Mindfulness-based Stress Reduction Program. As per its name, it incorporates the concept of mindfulness, which at its simplest is awareness of each moment as it occurs. It is achieved through the regular practice of mindfulness meditation and emphasizes an open awareness of thoughts and emotions (Evans, Ferrando, Findler, Stowell, Smart & Haglin, 2008). The research sample consisted of 20 male taxi drivers who were randomly assigned to a six week (one two-hour session per week) CBT or MBGBT course. Drivers were self-selected and tested at pre intervention, post intervention, and at one month follow-up. Kazemeini et al.'s study identified that MBCBT can be a useful tool to reduce driver anger and aggressive driving in non-clinical sample of taxi drivers.

2.1.2.1 Limitations of previous research

Previous research exploring the effectiveness of CBT on road user attitudes and behaviours is not without its limitations. Some of these limitations include the lack of objective measures of behavioural or attitudinal change (qualitative data only), a lack of a control group, a lack of female participants in the sample, and the use of drivers with psychological comorbidities (such as PTSD e.g. Strom et al., 2013). In addition, although not a research limitation per se, the lack of methodological consistency between research studies has limited the comparability of results.

However, years of research have supported the use of CBT with a wide range of conditions ranging in type and severity. This, along with findings relating to the use of CBT with car drivers show that there is potential to develop an intervention to support drivers who may be at heightened risk of collision through the effects of stress. To our knowledge, this intervention has not been used within the riding context in the United Kingdom, and research in this area would greatly contribute to this knowledge-base.

2.1.2.2 Summary of CBT and road safety

The evidence reviewed shows that cognitive behavioural therapy (in one or another form) can have a positive impact in reducing negative driver states (such as anger and risk taking) while on the road, and that this has the potential to be expanded to other driving (or riding) behaviours. However, it is important to note that although the evidence is promising, the research methods used are quite varied between research projects. This limits comparability, and hence conclusions should be drawn with caution.

Future research should aim to build on some of these limitations and provide evidence to support the use of CBT for rider safety.

3 Method

3.1 Design

A mixed-method, case study design was used. This involved collection of both quantitative (e.g. questionnaire data) and qualitative data from a small number of research participants.

A qualitative case study can help facilitate exploration of a phenomenon within its context using a variety of data sources (Baxter & Jack, 2008). Historically, it has been used in both clinical and social contexts, and has allowed for researchers to gain a better understanding of complex and diverse issues within a controlled environment. As Keen and Packwood (1995) put it, case study research is, *"a different way of thinking about complex situations which takes the conditions into account, but is nevertheless rigorous and facilitates informed judgements about successes or failures."*

Participants for the present study were drawn from the general motorcycling population subject to defined inclusion and exclusion criteria. Each experienced a course of CBT delivered by a professional CBT practitioner and participants riding experiences and insights over the course of the programme were recorded through logs and questionnaires.

3.2 Participants and recruitment

Participants were recruited via a filter questionnaire (Appendix D) developed specifically for this research. Details of the development of the questionnaire are provided in the Technical appendix (Appendix B)

The questionnaire was provided as a link and publicised through social media (Facebook, Twitter, motorcycle groups and forums). Participants were also recruited through the TRL participant database, and local contacts with motorcycling schools.

3.2.1 Participant selection

3.2.1.1 Participant criteria

Due to the specific topic and road user group of interest, it was important to ensure the intervention was offered to the appropriate audience; riders who:

- were affected by stress and who could identify (and report) clear signs of this;
- regularly ride a motorbike; and
- are exposed to life stressors that may be affecting their riding behaviour.

Frequency of riding

We were interested in motorcyclists who had the highest exposure to riding. This was operationally defined as riders who undertook more than three journeys on their bike in a week.

The research was also limited by time of year (November to March), therefore only participants who undertook motorbike journeys all-year round (and in any weather) were invited to take part in the research.

Exposure to life stressors

Exposure to life stressors was subdivided into two categories which could be broadly characterised by stress and the effect of this on riding.

1. The existence of a life stressor(s) (i.e. Is the participant experiencing identifiable stressors in their daily life in the past six months?)
2. Effect on riding behaviour or riding style (i.e. Is this stressor(s) having a perceived effect on their riding behaviour?)

The latter was of particular importance as many riders that were contacted for the purpose of the research felt that riding functioned as a stress-release. Although this does not exclude the presence of risky or dissociative behaviour while riding, it was beyond the scope of the present study to evaluate perceived versus actual riding behaviour.

Pre-existing psychological conditions

In addition to a set of specific inclusion criteria for participants, a number of exclusion criteria were also necessary. Exclusion criteria were developed together with the CBT practitioner, and related to pre-existing psychological conditions, particularly post-traumatic stress disorder (PTSD).

The decision to exclude participants based on any reported psychological difficulties, (or any indicators of such) was taken because the existence of other mental health conditions could potentially mediate the presence of stress or risk taking behaviours, and hence the CBT for stress may not be appropriate (or beneficial) for these respondents.

In addition, the CBT therapist advised that participants who had been diagnosed and treated for a mental health condition in the previous six months, would still be undergoing a period of consolidation (of previous therapy) which could also bias the results of the intervention on trial.

3.3 CBT sessions

3.3.1 Development and materials

As CBT directly dealing with rider-related stress is not currently a standard practice, a new session protocol had to be developed for the purpose of this research.

The structure of the therapy followed that of standard CBT practice, but was modified to include elements of riding and road behaviours.

3.3.2 Structure

CBT was delivered over a period of 6 weeks, comprising weekly one-to-one sessions for each participant with the CBT practitioner. Each session lasted one hour, and took place in a private office at Crowthorne House, TRL.

Brief CBT (a shortened, more focused version of the therapy) was employed (Cully & Teten, 2008). Although the sessions were tailored according to individual participant need, the structure of the therapy was as follows:

Sessions 1-2: Assessment of the problem, emotional state, and rider behaviour. This would include elements of education relating to the understanding of the problem,

mutual goals, and psychoeducation² (which was tailored to integrate rider-specific risk and road safety education; see Appendix G).

Sessions 3-4: Training in relaxation and coping strategies, including discussion of 'triggers' of unsafe riding behaviours.

Sessions 5-6: Exploring how to put elements of the therapy into practice, consolidation, and what it means to the rider in the long-term.

3.4 Data collection

3.4.1.1 Data collection process

Quantitative data was collected mostly³ by post. Questionnaires were posted to participants on two occasions:

1. Pre – one week before their first session with the therapist
2. Post – one to three weeks after their last (sixth) session with the therapist

3.4.1.2 Questionnaires

Participants completed two self-report questionnaires (before and after intervention), the Driver Stress Inventory (DSI) and the Driver Behaviour Questionnaire (DBQ).

DSI

Riders were asked to complete the DSI (Matthews et al., 1997) (Appendix H). The DSI is a 48 item scale that has been widely used in driver stress research, and has been found to measure a number of driver stress traits such as aggression ('AGG', 12 items), dislike of driving ('DIS', 12 items), thrill seeking ('TS', 8 items) and hazard monitoring ('HM', 8 items)⁴. Hazard monitoring, unlike the other subscales, represents a 'protective' factor, as it has been related to positive outcomes such as higher levels of psychological wellbeing (Matthews et al., 1997; Öz, Özkan & Lajunen, 2010; Rowden et al., 2011). Therefore, lower scores⁵ on the HM subscale represent safer attitudes toward driving.

² Psychoeducation is the process of teaching participants about the problem (in this case, stress) and its effects in order to facilitate the understanding and responsible handling of the problem (Bäumli, Froböse, Kraemer, Rentrop & Pitschel-Walz, 2006).

³ In order to ensure all data was received on time, one participant (whose therapy sessions ended in March) was asked to bring the completed questionnaires to his final session. All other participants returned the questionnaires by post 1 – 3 weeks after the end of their therapy.

⁴ The DSI also includes a subscale for fatigue; however, for the purpose of this research the items relating to fatigue were not included. This as fatigue is probably one the most frequently researched elements of driving behaviour and hence, its effect on driving and riding safety are already well established.

⁵ DSI includes items with mixed scales (i.e. on some items, higher scores reflect safer attitudes while on other items higher scores represent less safe attitudes). In order to have a clear response structure across DSI and DBQ (where higher scores represent less safe attitudes on all items) DSI items for which higher scores represented positive attitudes were reversed.

DSI item are assessed using a visual analogue scale⁶ (ranging from 0 to 10), and participants were asked to put a cross on the horizontal line.

In previous driver stress research (e.g. Matthews et al., 1997; Matthews 2002; Rowden et al., 2011), the four DSI subscales included in this study have been found to correlate with dangerous road behaviours such as speeding, traffic violations, driver errors, and accident involvement.

DBQ

Participants also completed the DBQ (Reason, Manstead, Stradling, Baxter & Campbell, 1990) (Appendix I). The DBQ contains 50 items on a five point Likert scale ranging from 'Never' (score of 0) to 'Nearly all the time' (score of 5). Participants were instructed to indicate their level of agreement or disagreement with a given statement.

The DBQ is also widely used within road safety. A recent meta-analysis of 174 studies (involving over 45,000 respondents) employing the DBQ showed that DBQ errors and violations are significant predictors of self-reported accidents (de Winter & Dodou, 2010). In addition, DBQ violations have been found to correlate directly with on-road simulated measures of driving behaviour (such as speed choice) (Helman & Reed, 2015); other research has also showed that both errors and violations have been found to be associated with high levels of stress experienced while on the road (Kontogiannis, 2006).

For the purpose of this study, a shortened version of the DBQ was used (Parker, Lajunen & Stradling, 1998; Lajunen, Parker & Summala, 2004). This version contained 26 items: 9 items covered violations, 2 items for unintentional violations, and 15 items for lapses.

Items on both the DBQ and DSI were re-worded in order to fit in with the motorcyclist sample involved in the current research study.

3.4.1.3 Qualitative data

Rider log

As part of the therapy, participants were asked to keep a weekly rider log in which they noted any specific events which had acted as stressors; participants were also asked to record how these situations were managed. These aided in understanding any changes in behaviours (or reactions to stressors) perceived by participants in a time frame that allows easy recollection of events.

This information was used during therapy sessions to encourage conversation and pinpoint any specific issues that could be worked on for the following week. It was also used to complement the questionnaire data, and provided case study analysis of improvements made week-on-week.

⁶ A visual analogue scale (VAS) aims to measure characteristics or attitudes that are believed to range across a continuum of values; this is, where a characteristic being measured does not take discrete jumps (as it would in a likert type scale). It is usually presented in a horizontal line anchored by word descriptors at each end (Gould, Kelly, Goldstone & Gammon, 2001).

Case summaries

The CBT practitioner provided a case summary report for each participant. The report included weekly discussion points and milestones reported by participants.

Qualitative feedback

At the end of the therapy, participants were provided with a short questionnaire in order to gain their feedback regarding their participation in the therapy. The questionnaire included two key questions:

- 1. What do you think motivated you to undertake (and commit to) the CBT provided through this research?*
- 2. Please give us some feedback about your experience with CBT for stress.*

3.5 Data analysis

As mentioned previously in Section 3.1, this research involved a mixed-methods design. Quantitative data was collected using the DSI and DBQ. Participant's scores on both these measures were compared from pre (before undertaking the intervention) to post (from 1 – 3 weeks after the intervention).

However, the experimental nature of this study as well as the small sample size involved meant that only descriptive statics were assessed.

Qualitative data was also collected in the form of weekly rider logs, a case summary developed by the therapist at the end of the treatment, and a short open text questionnaire provided to participants at the end of the treatment.

Rider logs and case summaries were used to support the questionnaire data, and where possible, to provide examples of reported changes in strategies used to cope with stressful events.

4 Results

4.1 Sample characteristics

Table 1 provides details of participant characteristics, including age and riding behaviours.

Table 1: Summary of participant characteristics

Age group	Gender	Primary transport	Secondary transport	Journeys by motorcycle (in a week)	How long have you been riding?	Type of bike
35-44	Male	Motorcycle/moped	-	More than six	3-5 years	Adventure sport
45-54	Female	Motorcycle/moped	-	More than six	3-5 years	Adventure Sport
25-34	Male	Motorcycle/moped	-	More than six	More than 10 years	Sports tourer
25-34	Male	Motorcycle/moped	-	More than six	3-5 years	Naked bike
55-64	Male	Motorcycle/moped	-	More than six	More than 10 years	Adventure sport
55-64	Male	Car	Motorcycle/moped	More than six	More than 10 years	Touring motorcycle
35-44	Male	Motorcycle/moped	-	More than six	6-10 years	Adventure sport

The mean age of participants was 44 years, and as shown in Table 1 (above) six of the seven participants were male. All participants reported being employed during the research period.

Participants included in the sample reported travelling an average of 8,583 miles a year by motorcycle; they also reported undertaking an average of 7 (before undertaking CBT) to 10 (after undertaking CBT) trips⁷ per week⁸. Most of the journeys undertaken by participants were for commuting purposes.

⁷ The number of trips was defined as the amount of one way journeys, i.e. a journey from home to work and back again constituted 2 journeys.

⁸ This was biased by the fact that one of the participants reported having an issue with his bike the week before starting his sessions, and another participant was not riding when he began the therapy as his bike was not considered roadworthy due to a recent collision.

4.2 Overall results

Although the initial sample included seven participants, two of the study participants dropped out after two therapy sessions. This was due to these participants (with the guidance of the CBT practitioner) being unable to identify any problems or difficulties in their riding, hence precluding discussion of riding and stress-related difficulties. Their data was therefore not included in any of the tables or descriptive statistics presented in the following sections⁹.

4.2.1 DSI

Figure 1 plots the average scores at pre and post for participants who completed the CBT course (n=5). Average scores show a trend toward a reduction in all four DSI subscale scores. This means that, on average, participants showed safer attitudes toward riding and better hazard monitoring after they had undertaken the CBT intervention.

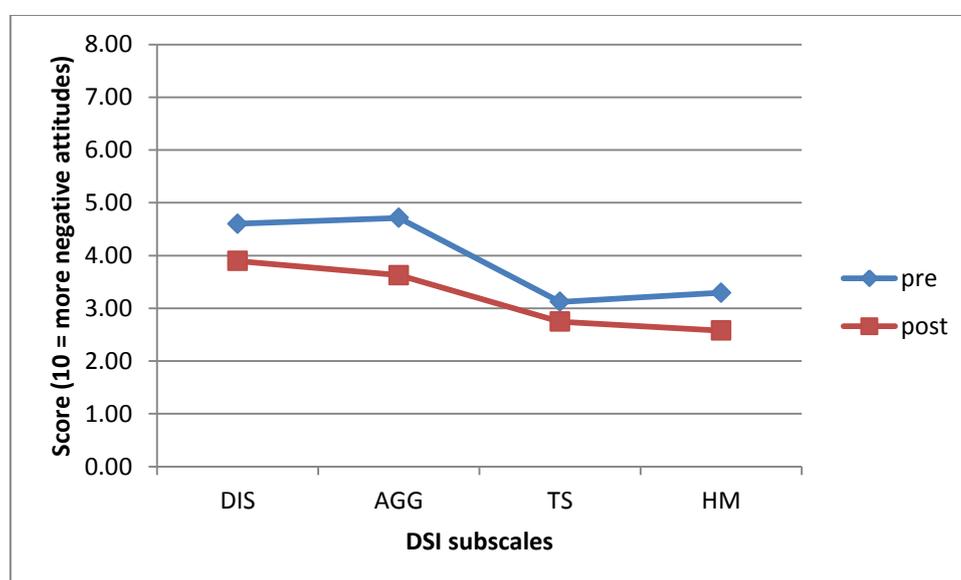


Figure 1: Line chart showing mean DSI scores for all participants, pre and post CBT intervention

The largest change occurred for the aggression subscale where, on average, participants were found to show a one-point score reduction on their attitudes from pre to post. Table 2 shows the average scores for each subscale.

⁹ Questionnaire data for participants who dropped out was assessed separately in order to gain insight regarding any differences in relation to reported trait stress or riding behaviour. Data showed no visible differences in 'pre' scores for either DSI or DBQ for the two drop-outs when compared to those who completed the therapy. Further information can be found in Appendix C.

Table 2: DSI mean scores, pre and post CBT intervention

Time point	DSI average score			
	DIS	AGG	TS	HM
Pre	4.60	4.71	3.12	3.29
Post	3.90	3.63	2.75	2.58

4.2.2 DBQ

Responses to DBQ also showed a trend in overall reduction in mean scores on all three DBQ subscales.

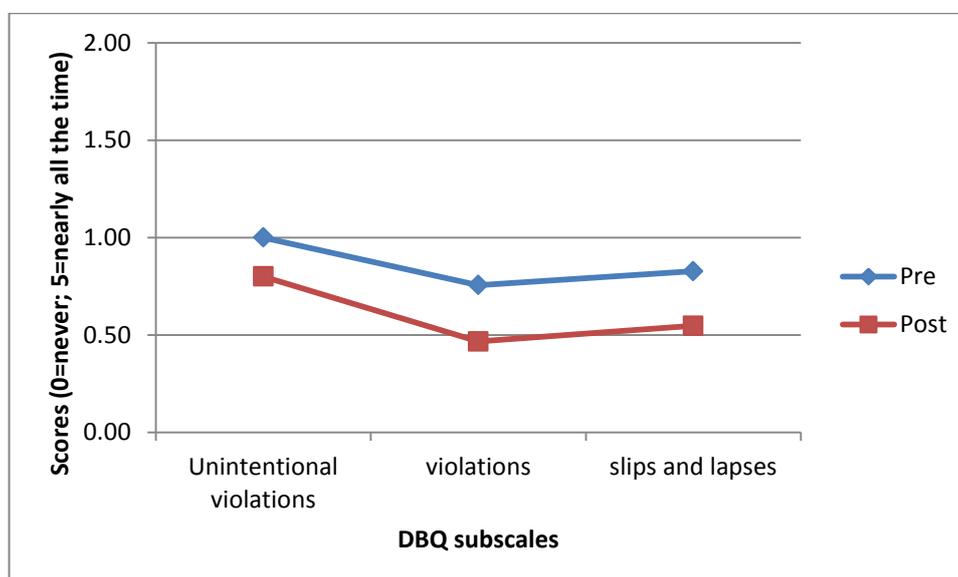


Figure 2: Line chart showing mean DBQ scores for all participants, pre and post CBT intervention

Although average scores on the DBQ subscales are relatively low in terms of the frequency with which riders admit to behaviours occurring, the change in DBQ scores observed post-intervention is consistent in the direction that is associated with lower collision risk.

4.3 Qualitative feedback

All participants who completed the CBT intervention reported having a positive experience engaging with the therapy and the therapist. Participants also reported that they believed the intervention had helped them improve their riding behaviours in a number of ways.

Some participants reported taking part in the intervention had made them more self-aware of their behaviours.

"I've learnt triggers which affect/ stress me, and some of them were not things I had realised before." – Female, 46 years old

Others believed it had helped them improve their mind set regarding their riding and other road users.

"I don't have a strong prejudice any more about other road users" – male, 37 years old

"[I am] less likely to be aggressive." – Male, 32 years old

Some participants also reported feeling more relaxed generally, and being able to cope more effectively with stressful situations.

"It has been very helpful; I can now shut out all of my work problems the minute I leave work. This means that I am much more relaxed on the way home..." – Male, 59 years old

"I've started to act on warnings I recognise, rather than just ignore them like before, i.e. if I'm too close to the vehicle in front, drop back" – Female, 46 years old

Even a participant who stated his feelings previous to undertaking the intervention as *"I would not say I have ever been someone who agrees these kind of methods work."*, reported having a positive experience as a result of the intervention.

"I enjoyed the sessions and honestly believe they have changed the way I ride for the better." – Male, 32 years old (2)

Although these positive comments towards the effectiveness of the CBT intervention are consistent with the results indicating benefit through lower risk on the DSI and DBQ scales, it is recognised that this study has a small sample of participants and no control intervention against which to benchmark the CBT approach.

4.4 Case studies

In the following section, we will detail results from a subsample of participants that exhibited the most substantial differences with relation to the two quantitative measures (DSI and DBQ) as well as through the weekly rider logs from the pre to post evaluation.

Data for each participant was broken down into four subsections:

1. Participant profile – providing general information about age, gender and life stressors reported. Information about dangerous riding behaviours reported will also be provided.
2. Session breakdown – this section will detail unique elements of the therapy sessions and the main areas identified for improvement. This data was provided by the therapist in the participant case summary.
3. Quantitative data – this section will provide data comparing changes in scores for the DSI and DBQ, at pre and post assessment.
4. Rider log – examples of 'triggers' (road traffic interactions) that participants identified through their weekly logs will be presented. These will provide a snapshot of attitudinal and behavioural changes reported by participants throughout the intervention.

4.4.1 Participant 1

4.4.1.1 Participant profile

Participant 1 was a 32 year-old male who reported riding an average of 6,000 miles a year. He reported undertaking an average of 6¹⁰ trips (before undertaking the intervention) and 10 trips (after the end of the intervention). Participant 1 has been riding a motorcycle for more than 10 years.

He reported three life stressors: work, financial concerns, and dealing with multiple responsibilities.

Participant 1 also believed stress was affecting his riding behaviours. He reported that in the past six months he had been feeling:

- Increased frustration with other drivers and/or riders
- Increased anger toward other drivers and/ or riders
- Increased risk taking while riding, including speeding, overtaking when unsafe to do so, or riding under conditions you wouldn't normally
- Increases in number of near-misses, or collisions with other road users

He completed the CBT intervention between November 2014 and January 2015.

4.4.1.2 Session breakdown (case summary)

The sessions for participant 1 were focused on helping the participant with a combination of lifestyle changes (exercising and eating habits) and promoting a better understanding of self, particularly relating to triggers of aggressive and anxious riding.

Two main learning areas were identified: 'letting go' of other road user's behaviours, and helping the participant to be more aware of his mood and surroundings when riding.

4.4.1.3 Quantitative data

A closer look at Participant 1's data shows that he exhibited up to a 1.8 point score reduction from pre to post assessment. The largest change was in relation to aggression (pre average score = 6.86; post average score = 5.06).

¹⁰ The number of trips at the 'pre' time point reported by Participant 1 was influenced by a problem with his motorcycle which made it temporarily unroadworthy.

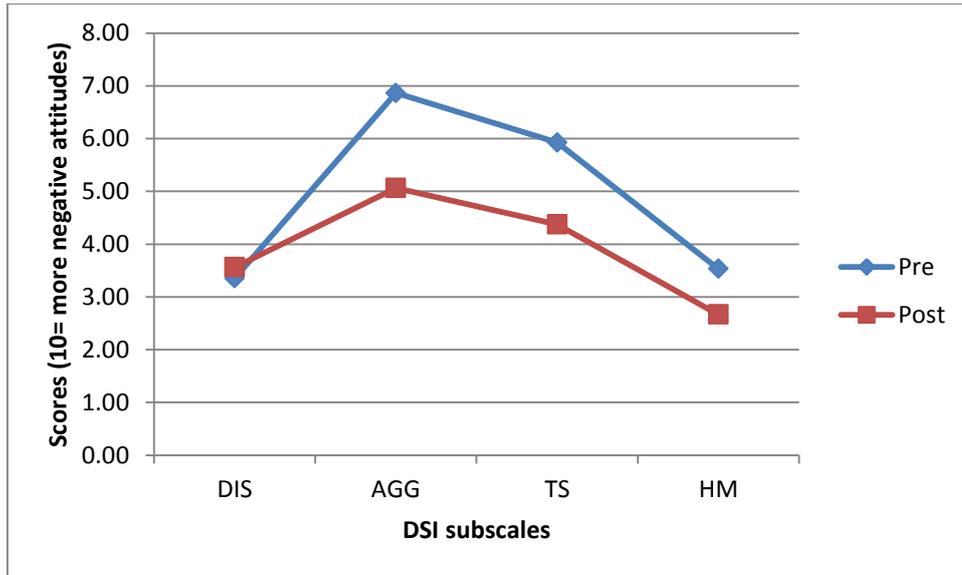


Figure 3: Line chart showing DSI scores for Participant 1, pre and post CBT intervention

The figure above also shows a very slight change in the subscale relating to dislike of riding. This change was only minor, and is likely due to normal variation within the data. Moreover, the participant reported he had not been affected by feelings of insecurity or anxiety while riding, which may also account for the relatively stable score in this subscale.

DBQ scores showed a similar trend with slips and lapses exhibiting the largest difference in scores from pre to post. This said, all scores on subscales were lower at the post assessment (when compared to the 'pre' time point).

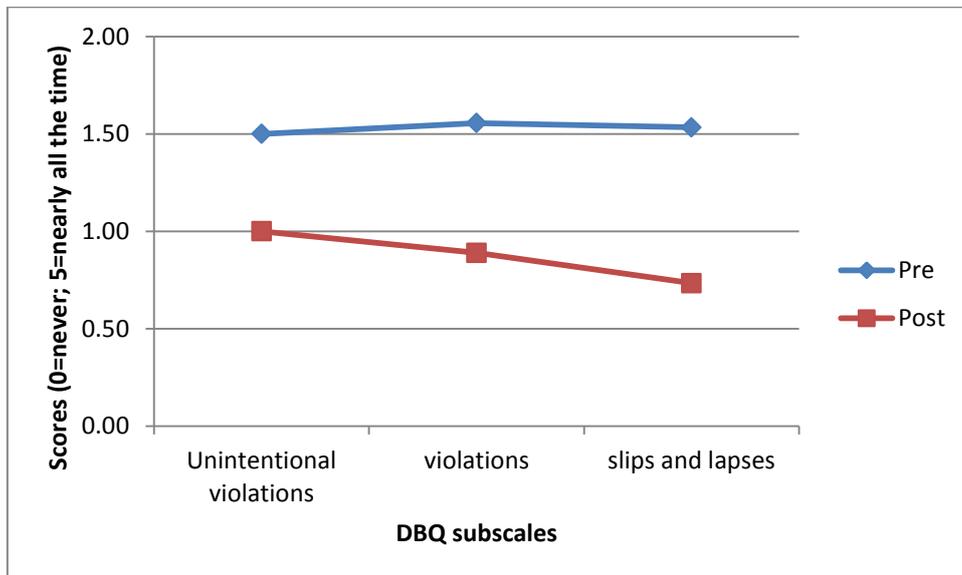


Figure 4: Line chart showing DBQ scores for Participant 1, pre and post CBT intervention

Interestingly, at the point of the initial assessment ('pre'), the participant also reported he had not experienced any increases in riding errors or lapses in the previous six months; however, a positive change in scores from pre to post was observed for slips and lapses.

4.4.1.4 Rider log

Throughout the intervention, Participant 1 reported a number of incidents he had experienced while riding his bike.

At Session 2, the participant reported two incidents with other road users which served as triggers of stress, anger, and anxiety.

Incident 1: Tesco parking

Session 2 Log	
Situation	people parking on wrong entrance and using disable spaces
Thoughts	<i>"it's wrong, I might end up with a blue badge one day"</i>
Feelings	Angry
Behavioural response	Wanted to scribble over windscreen, hard to let it go, watching them until they left.

Incident 2: Mini (car)

Session 2 Log	
Situation	pulled out from the side, locked up brakes and had to go round her
Thoughts	<i>"I don't want someone who will hit me behind me"</i>
Feelings	Anger and anxiety
Behavioural response	Overtook 3 cars in front of her, to make space between us, rode quicker for ½ mile

As evidenced by the two situations above, the participants was having trouble coping with situations, and was particularly troubled by feelings of anger toward other road users.

However, as the intervention progressed, it was clear that the participant was practising the coping strategies provided by the therapist, and that he was managing to use these

effectively in real road traffic scenarios. By Session 4, participant 1 reported better coping strategies for 'triggers'.

Session 4 Log	
Situation	Someone Pulled out – left no gap, slow driver
Thoughts	"let him get on with it"
Feelings	Calm
Behavioural response	pulled back, let driver get on with it.
Reflection after incident	"Pulling back is a better thing to do" – less dangerous, costs less in petrol(!), is worse when mood is bad, less shouting/muttering.

4.4.2 Participant 4

4.4.2.1 Participant profile

Participant 4 was a 46 year-old female rider. She reported riding an average of 9,500 miles a year, and undertaking an average of 8 trips per week. Participant 4 has been riding a motorcycle for 3-5 years.

She reported work was her main stressor, but also believed stress was affecting her riding behaviours. She reported that in the past six months he had been feeling:

- Increased frustration with other drivers and/or riders
- Increased anger toward other drivers and/ or riders
- Increases in riding and driving errors or lapses (e.g. finding yourself accidentally driving in the wrong direction)

Participant 4 undertook the CBT intervention between January and February 2015.

4.4.2.2 Session breakdown (case summary)

The sessions for participant 1 were focused on helping the participant to 'look after herself' (the participant had been suffering some unattended health issues), and helping her to manage work-related stress which was also affecting aspects of her riding such as mood and concentration.

Two main learning areas were identified: 'letting go' of other road user's mistakes (when "other people don't follow 'my rules'"), and helping the participant to improve concentration while riding (i.e. not thinking about work or past negative experiences).

4.4.2.3 Quantitative data

Similar to Participant 1, Participant 4's quantitative data show a positive shift in attitudes on the DSI. The biggest improvement for this participant was also in the aggression subscale, where she exhibited a 1.9 point change from pre to post.

Similarly, her hazard monitoring (as measured by DSI) also showed a 1.7 point change in scores from pre to post. This corresponds well with details of the session breakdown where 'concentration' was identified as one of the key areas of improvement by the therapist and participant alike.

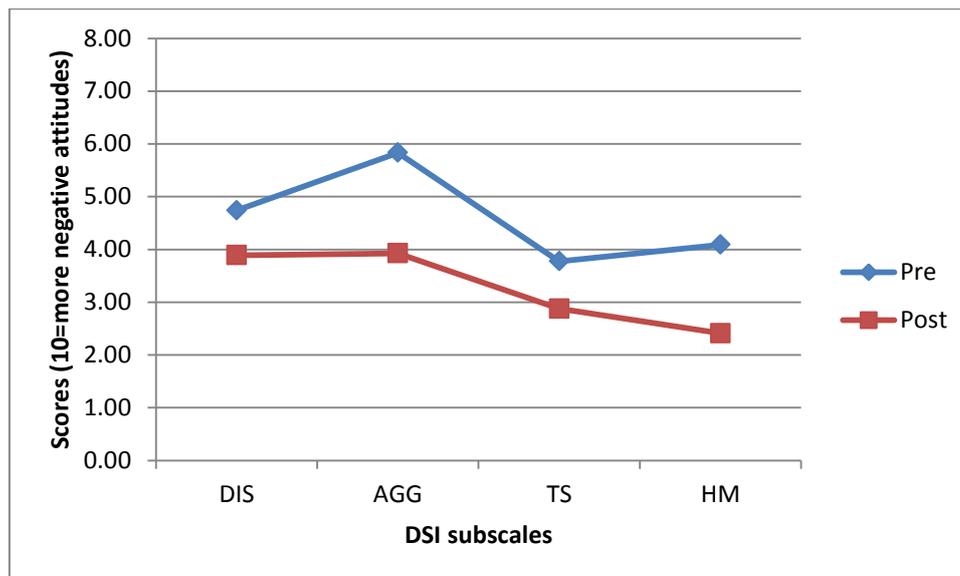


Figure 5: Line chart showing DSI scores for Participant 4, pre and post CBT intervention

DBQ scores show a similar trend from pre to post for this participant. The biggest change corresponded with the score for violations, where the participant showed a half a point change in scores from pre to post (as seen in Figure 6 below).

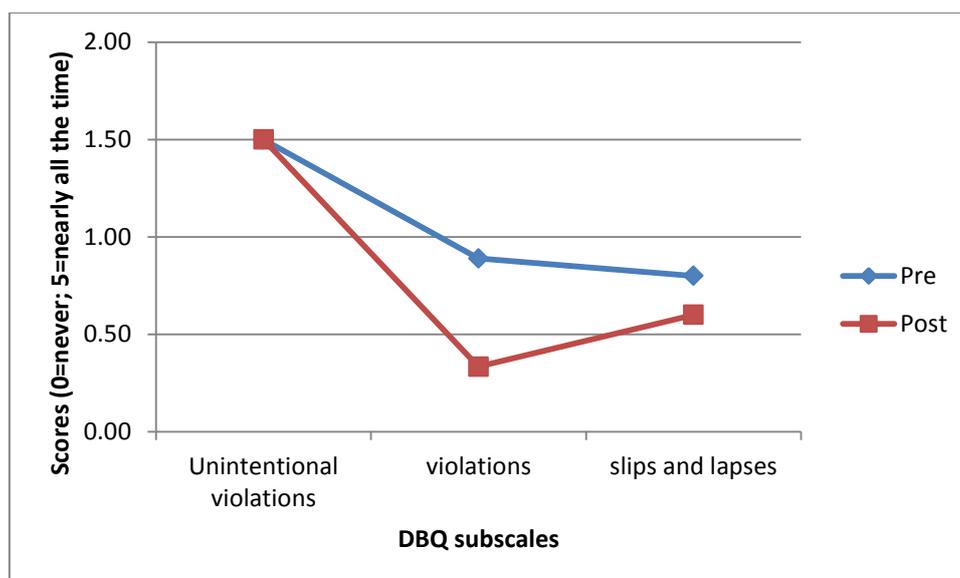


Figure 6: Line chart showing DBQ scores for Participant 4, pre and post CBT intervention

Figure 6 also shows that Participant 4 did not achieve a change in score for the unintentional violations subscale of the DBQ. However, as the participant started with a very low score at the 'pre' assessment; therefore, it was unlikely that an intervention could bring about significant change in this score.

4.4.2.4 Rider log

Participant 4 was also able to identify 'triggers' of her riding stress throughout the intervention.

At session 2, she provided an example of a situation which caused her to be angry while riding. She also reported this incident affected her mood through the day (hard to 'let it go').

Session 2 Log	
Situation	Someone parked too close and damaged car
Thoughts	<i>"Why is my door damaged? I did my level best to park properly. I wouldn't do it that way, so why are others doing it to me?"</i>
Feelings	Anger
Behavioural response	Wanted to let anger out, but knew she couldn't direct it at anyone
Physiology	None identified.

However, by session 5, the participant was able to re-think her reactions toward 'triggers', and react more calmly (and presumably safely).

Session 5 Log	
Situation	example of a "near miss" on Friday
Thoughts	"you idiot, you didn't even see me"
Feelings	sense of threat/anxiety
Behavioural response	reacted safely and quickly. Incident didn't linger, didn't mention it to husband after, didn't overreact.
Physiology	Initial heart jump but no other sensations
Reflection after incident	<i>"felt a lot calmer, did not feel annoyed for long after incident, let it go more easily even though it was a close call."</i>

4.4.3 Participant 5

4.4.3.1 Participant profile

Participant 5 was a 59 year-old male rider. He reported riding an average of 9,000 miles a year, and undertaking an average of 10 trips per week. Participant 5 has been riding a motorcycle for over 10 years.

Although he did not report any key stressors, he believed that his occupation regularly caused him to be stressed, anxious or depressed, and that this was affecting his riding behaviours.

Participant 5 reported that in the past six months he had been feeling:

- Increased frustration with other drivers and/or riders

Participant 5 undertook the CBT intervention between January and March 2015.

4.4.3.2 Session breakdown (case summary)

The sessions for participant 3 were focused mainly on helping him cope with his work-related stress, and to help manage the effects of stress on his riding behaviour. The sessions (particularly at the beginning) also focused on helping the participant improve his assertiveness, particularly in relation to his work life.

The main learning area identified was separating work from his outside life. However, within this, the participant also learned to manage his feelings toward other road users (i.e. being more tolerant (and less "annoyed") when riding). He also acquired a greater self-awareness while riding and identified how his riding style might need to be adjusted to prevent future incidents.

4.4.3.3 Qualitative data

Participant 5 showed small changes from the pre to post evaluation. His biggest change was in relation to dislike of riding, where he showed a 1.25 point change in attitudes from pre to post.

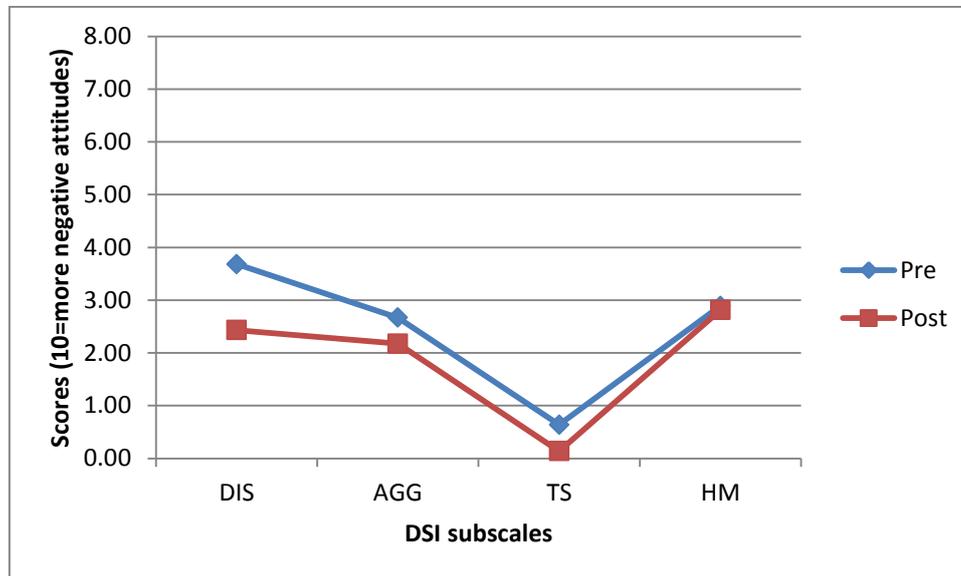


Figure 7: Line chart showing DSI scores for Participant 5, pre and post CBT intervention

Scores on the hazard monitoring measure of the DSI remained stable from pre to post. The thrill seeking and aggression subscales showed a minor change.

DBQ scores showed that participant 5's scores for each of the subscales were relatively stable from pre to post assessment. Some small changes were observed for the slips and lapses subscale.

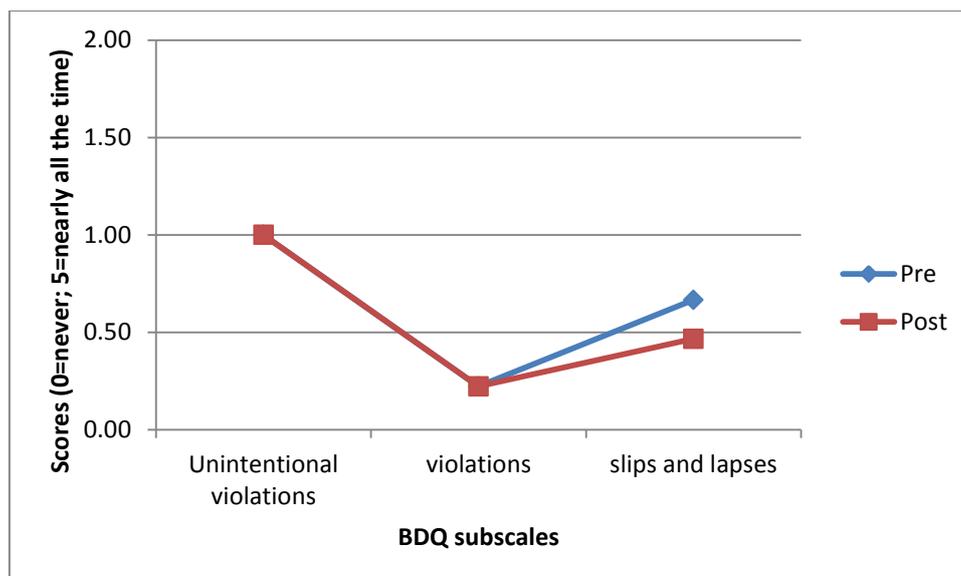


Figure 8: Line chart showing DBQ scores for Participant 5, pre and post CBT intervention

4.4.3.4 *Rider log*

The participant was able to identify ‘triggers’ for his stress, though these were not always riding-related.

In session 2, the participant identified work situations causing him to be stressed.

Session 2 Log	
Situation	Work tasks
Thoughts	“I’ve got to do X,Y,Z. I have a lot to do. I need to remember this and that.”
Feelings	Resentment, stress
Behavioural response	Making mental notes, thinking about work all the time, affected sleep
Physiology	Tiredness and exhaustion

Although participant 5 did not report specific situations that had triggered negative feelings or reaction while riding at the beginning of the intervention, toward Sessions 4 and 5, the participant had actively identified a number of situations which he felt could have acted as triggers, but did not due to his improving state of mind.

Session 4 Log	
Situation	Friday traffic, bad rain, blocked roads
Thoughts	This is hard work. So much rain. I must concentrate.
Feelings	Generally calm
Behavioural response	More defensive riding, slower, being extra vigilant
Physiology	None identified.
Reflection after incident	Has "less noise" in his head when riding and even on more difficult journeys, he feels less stressed.

Session 5 Log	
Situation	Dangerous driver pulled out in front, had to break sharply
Thoughts	<i>"Take it easy, don't get worried, you are still going"</i>
Feelings	Initially startled, worried
Behavioural response	Took it easy
Physiology	Hot
Reflection after incident	Noticed that it only took 10-15 seconds to calm down after near-miss incident and that he was able to continue with his journey without any difficulty.

As evidenced by the logs in later sessions of the therapy, the participant had been able to identify changes in his own attitudes and behaviours while riding. Although he had not expressed riding as his initial concern, it was clear to him that reducing his work stress (and being able to leave his work behind) had helped him deal with 'triggers' in a more calm and safe way.

4.4.4 Summary of case studies

Section 4.4 provides a snapshot of how some of the research participants interacted with intervention, and how taking part in CBT for stress has helped them to develop safer attitudes toward their general lifestyles and riding. This was evidenced by some changes

in their responses to two previously validated questionnaires, the DSI and DBQ, as well as by the qualitative data provided through the rider logs and the case summaries.

These data suggest that CBT has been beneficial to participants in the short-term. Participants have not only exhibited quantitative changes in their attitudes relating to stress vulnerabilities (as measured by DSI), but have also shown positive changes on their reported violations (intentional and unintentional) and riding errors.

The data also suggest that the intervention was able to help meet participant's individual needs, and in some cases the most significant changes were observed in the areas of life participants had identified as key concerns.

5 Discussion and Limitations

The purpose of this research was to undertake a short-term evaluation of a six week one-on-one CBT intervention for the treatment of rider stress. Although the present research involved a small sample (n=7 initial recruitment; n=5 completing the programme), the results showed a positive overall trend toward an improvement of road safety attitudes among participants. This is consistent with previous research in the health care CBT literature, but also with more recent literature relating to the use of CBT in road safety (Najeeb, 2008; Strom et al., 2013; Kazemeini et al., 2013).

This research builds on previous literature by providing a mix of quantitative and qualitative data. It also provided participants with a one-on-one intervention that targeted the individual's needs; previous interventions, such as those employed by Najeeb, 2008 and Kazemeini et al. 2013, involved group therapy sessions targeting particular road behaviours (such as speeding). The latter is important as stress is unique to each individual, and the way that stress affects mood and behaviours can be regulated by a number of variables including individual characteristics. The present intervention allowed participants to focus on difficulties that were unique to them. This aligns with Matthews et al.'s suggestions (Matthews et al., 1998; Mathews, 2002) that interventions for driver/ rider stress need to take into account individual differences and vulnerabilities to stress. Matthews and colleagues (1998) stated:

"Practical interventions require a fine-grained understanding of how drivers' coping strategies and appraisals of the traffic environment vary across individuals and situations."

Furthermore, Matthews (2002) later states that the effects of stress may be more damaging to road safety when cognitive processing is substantially biased and when this bias perpetuates maladaptive reactions to specific demands, for example, drivers prone to anger may misread the intentions of other drivers.

The CBT employed in this research was a shortened, more focused version of the longer term CBT therapy. Nonetheless, the findings suggest that, in this sample of participants, the intervention was able to produce some shifts in road safety attitudes they reported before the intervention.

Some of the strengths of this research are the inclusion of a mix of male and female participants, as well as a mix of motorcycle types, and the sources of life stressors that were reported. Participants were also assessed to ensure they were (by self-report) free of any major psychological conditions. This was to achieve the aim of a participant sample who were experiencing 'every day' forms of stress such that the results can be considered within a wider riding population. Further screening of participants also meant that the final sample did not include participants who had recently undertaken a similar therapy, and hence could bias the results of the research.

Limitations of this research include the small sample size involved, which was further limited by two participants dropping out after only two sessions. This meant data were only available for five participants. The difficulties in recruiting suitable participants represent a significant challenge. Motorcyclists are relatively small subset of road users from which recruitment is from the subset for whom CBT would likely be beneficial. Add to that the need for the participants to be able to attend six regular CBT sessions and the difficulties in achieving large sample sizes are clear.

Another potential limitation is the fact that participation in other rider training programs prior to undertaking CBT was not controlled for. However, the fact that data was collected at (and compared to) the 'pre' time point meant that any changes in attitudes or behaviours due to taking part in other programmes would have been (to an extent) accounted for. The lack of a control group was also a limitation of the current study.

Overall, the results of this research are encouraging. They are consistent with studies of CBT in car drivers, suggesting that it could be an effective tool for rider stress and stress-related anxiety or worry. Future research should aim to conduct a more in-depth evaluation of this intervention through experimentation including larger numbers of participants and a control group.

6 Recommendations

After undertaking this research, and in light of this and similar findings, we recommend that a larger-scale evaluation of CBT with motorcyclists is undertaken. Bearing in mind the difficulties in participant recruitment, this should involve a larger sample of participants as well as a matched control group in order to account for the effects of variables that, due to limitations in scope, have not been taken into account for the present research. Were such a larger study to demonstrate success in terms of improved safety and enjoyment of riding, it may be appropriate to consider how CBT could be introduced into regular rider training courses.

If CBT were to be developed as an intervention to support riders and drivers, care would be needed around the way in which it is presented to potential users. Although attitudes are changing, for some, there still remains a social stigma attached to mental health and interventions that might be applied to improve it. In this project, great efforts were made to ensure that participants' involvement in the study was not associated with the implication that their mental health was in question. Continuing from this, it can be recommended that efforts should be made to present CBT as a strategy to support safer, better and more enjoyable riding/driving without any suggestion that would bring any kind of prejudice upon them.

It is apparent that CBT, already widely used in other contexts and with a developing evidence base in road safety, could also be considered as an intervention to reduce collision risk in other driving populations including bus, coach, truck and train drivers. Its effectiveness in these contexts should therefore also be explored.

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Appendix A Additional data and figures, Participants 2 and 3

A.1 Participant 2

A.1.1 Participant profile

Participant 2 was a 37 year-old male. He reported riding an average of 7,000 miles a year, and undertakes an average of 10 trips a week (commuting to and from work).

He reported having suffered physical illness and work-related stress in the last six months.

Participant 2 reported that in the last six months he had been experiencing:

- Insecurity or anxiety while riding
- Increased frustration with other drivers and/or riders

A.1.2 Qualitative data

Participant 2's data showed mixed results. While he exhibited some small (positive) changes in aggression and hazard monitoring, his Thrill seeking score was higher at the post intervention.

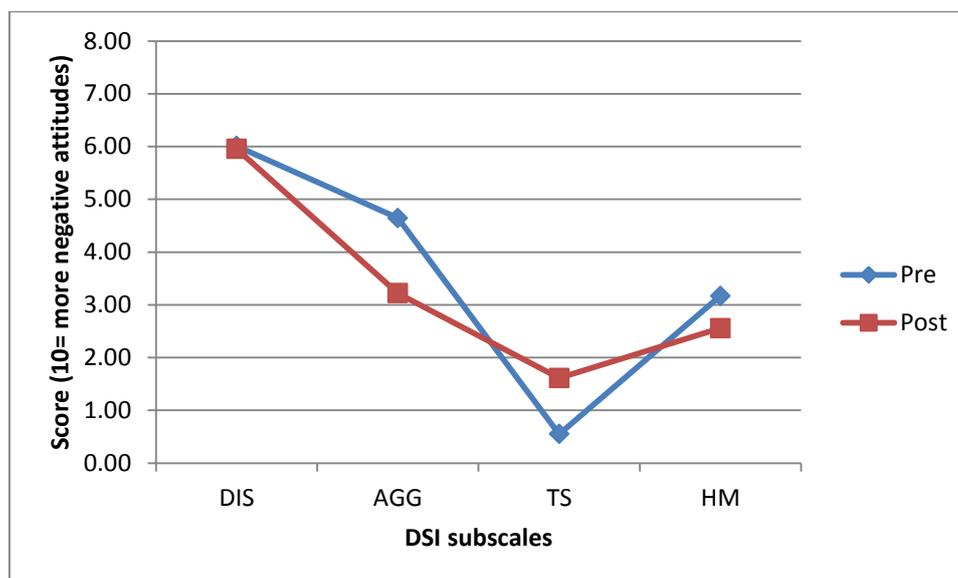


Figure 9: Line chart showing DSI scores for Participant 2, pre and post CBT intervention

DBQ scores also showed a similar trend, as participant 2 exhibited slightly higher scores for violations, and slips and lapses at the post intervention assessment.

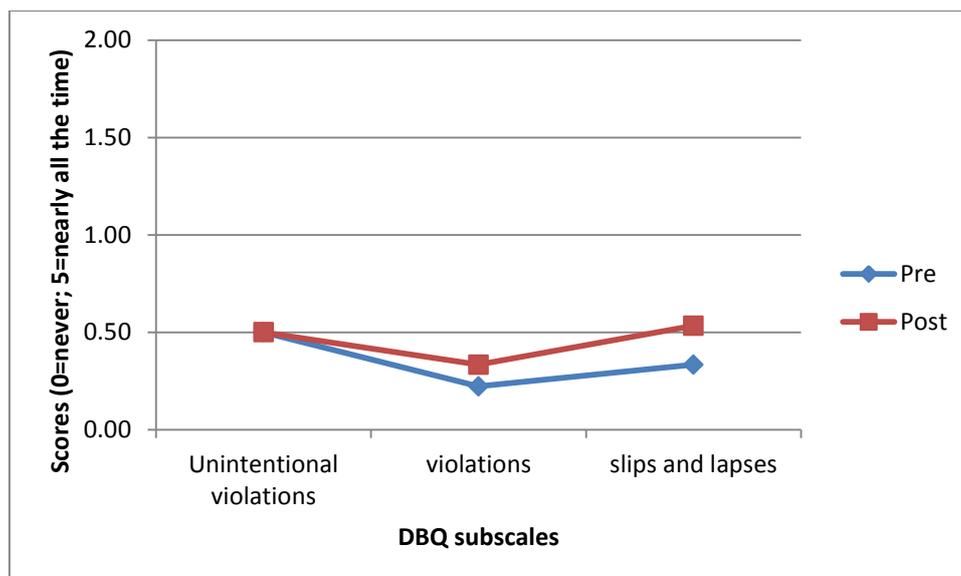


Figure 10: Line chart showing DBQ scores for Participant 2, pre and post CBT intervention

However, Table 3 shows scores on DBQ subscales were very low to begin with (the highest DBQ subscale score was .53 on average) and given that the changes were so small, this could be due to normal variation in responses.

Table 3: DBQ scores for Participant 2, pre to post CBT intervention

Time point	Unintentional violations	violations	slips and lapses
Pre	.50	.22	.33
Post	.50	.33	.53

A.2 Participant 3

A.2.1 Participant profile

Participant 3 was a 32 year old male rider. He reported riding an average of 10,000 miles a year, and undertaking an average of 10 trips per week. Participant 3 has been riding a motorcycle for 3-5 years.

He reported financial concerns as his main stressor, but also believed stress was affecting his riding behaviours. He reported that in the past six months he had been feeling insecurity or anxiety while riding. This was likely related to the fact that this participant had experienced a serious road traffic collision on his motorcycle about six weeks prior to undertaking the CBT intervention¹¹. He had been injured in the accident, and had been signed off work for two months. The participant returned to work toward the end of the intervention.

¹¹ Participant 3 was the only participant in the sample to have experienced a recent collision.

It is important to note that Participant 3 is somewhat different from the other cases as, through the intervention, it was identified that some of his anger-related issues may be more deeply rooted. At the end of the intervention, the participant and therapist discussed the possibility of further future counselling.

In addition, the effects of the collision he had recently suffered meant that he was is a different mind-set in relation to his riding.

Participant 3 undertook the CBT intervention from December 2014 to February 2015.

A.2.2 Qualitative data

The section above provides some insight into participant's 3 state of mind when he undertook the CBT therapy. However, as evidenced by his DSI data, although not directly affected by stress, participant 3 was able to show some shifts in his attitudes.

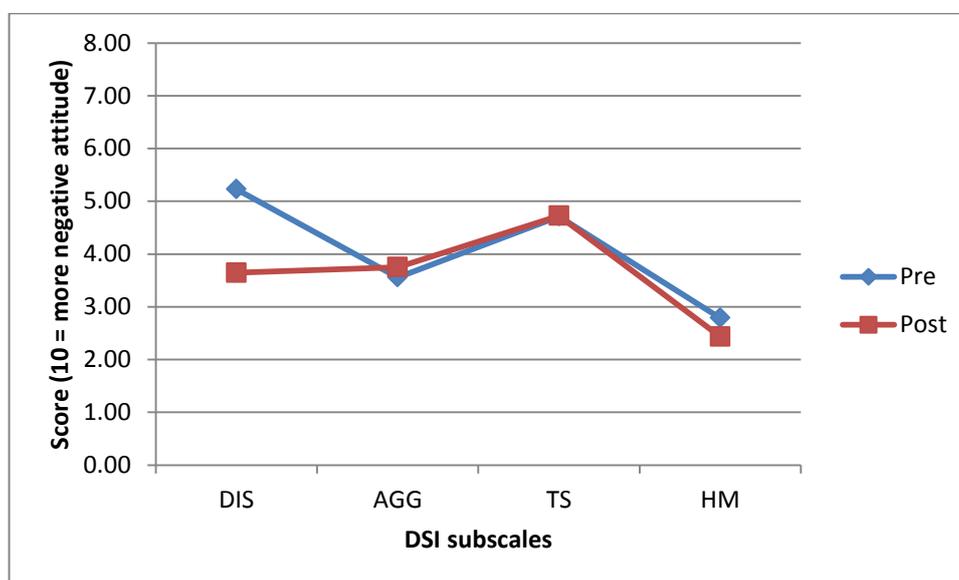


Figure 11: Line chart showing DSI scores for Participant 3, pre and post CBT intervention

Figure 11 shows that the biggest change for Participant 3 was in the scores relating to dislike of riding. This corresponds well with the fact that he undertook the therapy following an injury accident and it is likely that he was experiencing heightened levels of anxiety while on the road.

Although no major changes were evidenced in his levels of aggression or thrill seeking, a small change in post scores for hazard monitoring was shown.

On the other hand, DBQ scores show that participant 3 experienced a small reduction in all subscale scores at the 'post' time point.

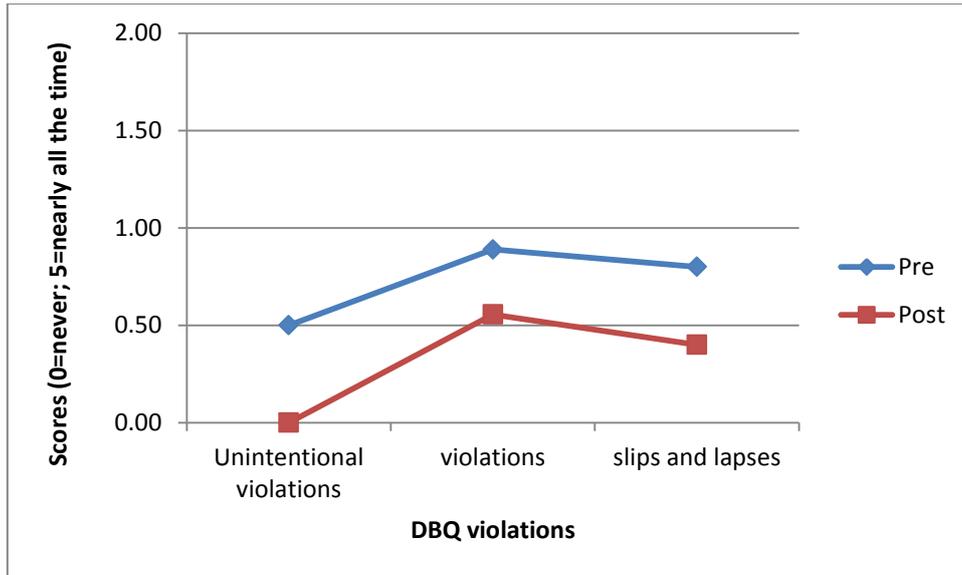


Figure 12: Line chart showing DBQ scores for Participant 3, pre and post CBT intervention

Appendix B Further detail on research methods and data collection

This section presents further detail regarding the development of the filter questionnaire as well as details of the entire sample of participants (n=7), previous to participant drop-outs.

B.1 Filter questionnaire development

CBT is a therapy used in clinical contexts, and although it has begun to be applied more widely, it is necessary to ensure that the therapy on offer was right for participants who received it. For this reason, a filter questionnaire was developed and put through a number of channels in order to select participants who would meet the specified criteria.

The questionnaire included basic demographic questions such as age and gender, as well as questions that assessed riding frequency and style.

B.1.1 Life stressors

Another set of questions related to life stressors. A list of common stressors was provided and participants were able to tick multiple answers. These included:

- Physical illness
- Mental illness
- Work-related stress
- Parenting stress
- Caregiver stress
- Financial concerns
- Legal issues
- Job loss
- Multiple responsibilities

B.1.2 Effects of stress

The perceived effect of life stressors on riding was also measured. Participants were provided with a list of six risky riding behaviours that may be associated with stress:

- Insecurity or anxiety while riding
- Increased frustration with other drivers and/or riders
- Increased anger toward other drivers and/ or riders
- Increased risk taking while riding, including speeding, overtaking when unsafe to do so, or riding under conditions you wouldn't normally
- Increases in number of near-misses, or collisions with other road users
- Increases in riding and driving errors or lapses (e.g. finding yourself accidentally driving in the wrong direction)

Participants were able to tick multiple answers, or add other effects or behaviours they had experienced while riding.

B.1.3 Indication of potential psychological conditions

As mentioned previously, this was an important exclusion criteria as the therapy being offered through the present research was not developed to deal with more serious or potentially life threatening disorders, such as PTSD. It was therefore deemed necessary to exclude participants who showed indicators of particular conditions.

The questionnaire included two sets of questions to help screen out people who may have major clinical issues including post-traumatic stress disorder (PTSD) or some personality disorders.

B.1.3.1 PTSD

The PTSD measure used is based on the Primary care PTSD screen (Prins et al., 2003). This is a short, four item questionnaire has been used to identify signs of PTSD in different populations.

As the answers to the questions contained represent a high level of arousal as a result of a recent event (in the last month), any participant who answered 'Yes' to two or more questions was screened out.

Personality disorders

The personality assessment was based on the Standard Assessment of personality abbreviated scale (SAPAS; Moran, Leese, Lee, Walters, Thornicroft & Mann, 2003). This short questionnaire includes eight general personality questions, such as 'In general, do you trust other people?'. The scores for the questions range from 0 ('Yes') to 1 ('No'), with one item being reverse scored (i.e. 'Yes' = 1).

The cut-off score established by Moran et al. is three or four; however, this research was done with clinical populations. As the present research involved a segment of the 'normal' population who had not reported a recent diagnosis, a cut-off of four was established. The only exception to this rule was if a participant answered 'Yes' to two questions:

- Do you normally lose your temper easily?
- Are you normally an impulsive sort of person?

Consultation with the therapist revealed that 'Yes' answers to these two questions could be a potential indicator of aggressive personalities and hence risk-taking (or other dangerous behaviours) may be influenced by this particular trait. Again, the therapy being offered was not able to deal with more serious personality conditions and participants were excluded.

Although participants who exhibited any potential disorders were excluded from the research, a special email was sent to participants who scored above the cut-off points for each measure. The email provided details of services available such as talking therapies and the NHS psychological services.

Appendix C Sample characteristics

As mentioned in section 4.1 above, two of the seven participants dropped out after only two therapy sessions. Further investigation of their pre questionnaire data showed no visible differences between participants in relation to their pattern of responses to the DSI and the DBQ.

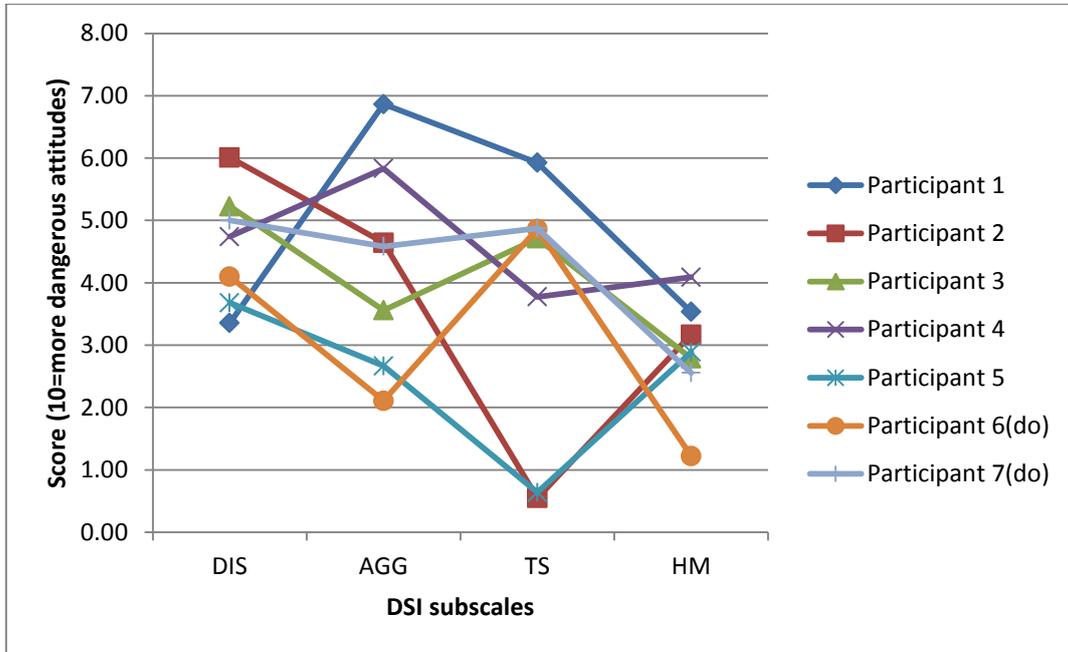


Figure 13: Line chart to show DSI Scores for all four subscales, by participant (n=7)

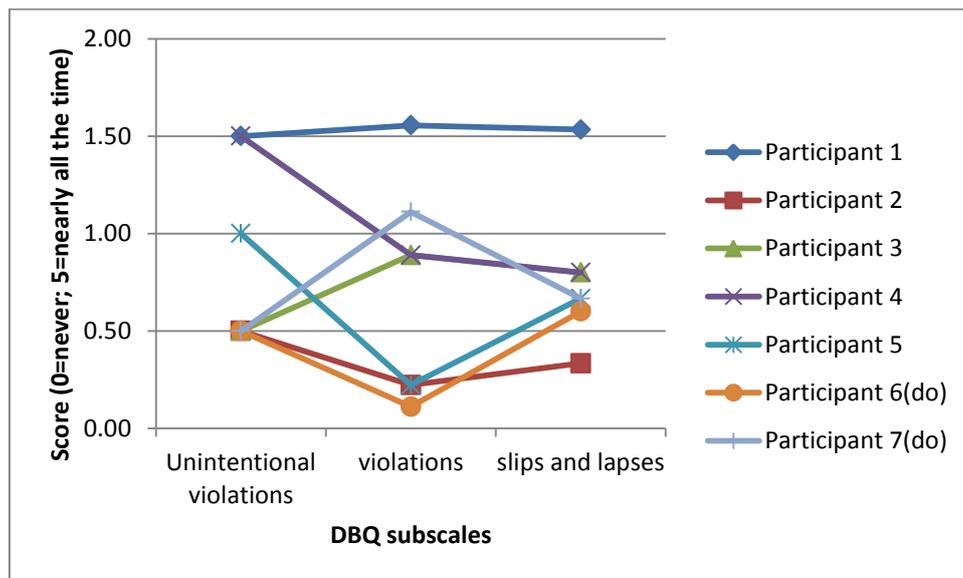


Figure 14: Line chart to show DBQ Scores for all three subscales, by participant (n=7)

Appendix D Filter questionnaire

Motorcyclist screening questionnaire

Page 1

You have indicated that you are interested in taking part in research by the Transport Research Laboratory (TRL) and the Institute of Advanced Motorists (IAM). This study relates to stress while on the road, and is particularly concerned with helping with stress management.

We are looking for motorcyclists/ moped riders who have been experiencing high levels of stress in the previous six months. In particular, we are interested in people who feel their riding style or riding behaviour has been affected by feelings of stress and stress-related anxiety or worry.

In order to find out your suitability for this research, we would like to find out a little more about you.

Please fill in the questionnaire as honestly as possible. The answers you provide will help us to ensure that the research and the intervention being offered are appropriate. Please note that completion of this short questionnaire does not guarantee you will be selected to take part in the research.

Please keep in mind that your participation is voluntary and you may withdraw without giving reason for doing so. However, if you decide to proceed with the questionnaire and are selected to take part in the research, the answers you provide will only be seen by the members of the TRL research team who are ethically and legally bound to uphold your privacy. Your answers will not be used to identify you personally in any other way, or shared with third parties.

Consent

1) Before we can begin the questionnaire we need to check a few things with you. Please state whether you agree with the following statements:

1. I feel sufficiently informed as to the questionnaire's purpose
2. I am aware that I am free to withdraw from the questionnaire at any time
3. I give my informed consent to participate in this questionnaire *

I agree to take part in this questionnaire.

I do not agree to take part in this questionnaire.

About you

2) How old are you? *

under 18

18-24

25-34

35-44

45-54

55-64

65+

3) What is your gender?

- Male
 Female

4) Currently, what is your primary mode of transport?

Note: 'Primary' is your default mode of transport. I.e. what you use on a regular basis for your travels.

E.g. You own a car, but travel to work everyday using public transport. Public transport is therefore your primary mode.

*

- Bicycle
 Car
 Motorcycle/ moped
 Van (under 3.5 tonnes)
 Van or lorry (3.5 tonnes or over)
 Walking
 Public transport (train and/ or bus)
 Other (please specify):

About you**5) Currently, what is your secondary mode of transport?**

Note: 'secondary' is the mode of transport you choose to use on special occasions or as an alternative to your primary mode.

E.g. You drive a car to work everyday, but at the weekend you usually use your motorbike to travel to your destination. Motorcycle/ moped is therefore your secondary form of transport.

*

- Bicycle
 Car
 Motorcycle/ moped
 Van (under 3.5 tonnes)
 Van or lorry (3.5 tonnes or over)
 Walking
 Public transport (train and/ or bus)
 Other (please specify):

Your riding**6) Which statement best describes your current riding pattern? ***

- I ride all year around in any weather
- I ride all year round in all but the most extreme weather
- I ride all year around but only in fair weather
- I only ride in the fair weather seasons

Your riding

7) Do you commute daily (or most days) to/ from work on your motorcycle/ moped?

- Yes
- No

8) How many journeys do you make on your motorcycle/ moped in an average week?

Note: Riding to work and back would be two journeys.

*

- I don't usually ride every week
- One or two
- Between three and six
- More than six

9) For how long have you been riding a motorcycle/ moped? *

- A year or less
- 1-2 years
- 3-5 years
- 6-10 years
- More than 10 years

Breaks from riding

10) Have you recently come back to riding from a long break, i.e. three or more years?

- Yes
- No

Breaks from riding

11) After your break, when did you return to motorcycling riding?

- Less than six months ago
- One year ago
- Over a year ago

Type of bike

12) What type of bike do you ride? *

- Sports bike
- Scooter
- Moped
- Naked bike

- Custom/ Cruiser
- Adventure sport
- Touring motorcycle
- Other (please specify):

Your riding

13) How important to you are the following factors in terms of riding a motorcycle/ moped?

	Not at all important	Quite unimportant	Neither important nor unimportant	Quite important	Very important
Not having to rely on others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pitting myself against others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feedback, including noise and vibration.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Getting away from everyday life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A sense of belonging and camaraderie.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feeling the wind rushing past you.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Having much more power than in a car of the same price.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Being able to get to places quicker.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The fact I look good on the motorcycle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A sense of heritage or tradition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Your health

14) In the past six months, have you experienced any of the following (*tick all that apply*):

*

- Physical illness
- Mental illness
- Work-related stress
- Parenting stress
- Caregiver stress
- Financial concerns
- Legal issues
- Job loss
- Multiple responsibilities
- None of the above
- Other (please specify):

15) Do you believe that your occupation regularly causes you to be stressed, anxious or depressed?

- Yes
 No

16) Do you believe your riding behaviour has been affected by stress, anxiety or depression?

- Yes
 No

17) While riding in the past six months, have you experienced any of the following (*tick all that apply*):

Note: a 'near-miss' is any situation where you had the impression that you only just avoided an accident.

*

- Insecurity or anxiety while riding
 Increased frustration with other drivers and/or riders
 Increased anger toward other drivers and/ or riders
 Increased risk taking while riding, including speeding, overtaking when unsafe to do so, or riding under conditions you wouldn't normally
 Increases in number of near-misses, or collisions with other road users
 Increases in riding and driving errors or lapses (e.g. finding yourself accidentally driving in the wrong direction)
 Other (please specify):

18) Have you suffered any major medical issues in the past year?

- Yes
 No

19) Have you been diagnosed or treated for any psychological condition including Post-traumatic stress disorder (PTSD), depression, anxiety, or any other mood disorder in the last six months? *

- Yes
 No

Your health

20) In your life, have you ever had any experience that was so frightening, horrible, or upsetting that, in the past month, you...

Yes

No

- | | | |
|---|--------------------------|--------------------------|
| Have had nightmares about it or thought about it when you did not want to? | <input type="checkbox"/> | <input type="checkbox"/> |
| Tried hard not to think about it or went out of your way to avoid situations that reminded you of it? | <input type="checkbox"/> | <input type="checkbox"/> |
| Were constantly on guard, watchful, or easily startled? | <input type="checkbox"/> | <input type="checkbox"/> |
| Felt numb or detached from others, activities, or your surroundings? | <input type="checkbox"/> | <input type="checkbox"/> |

Your health

21) Below are some questions about you and how you would describe yourself.

Only tick 'Yes' if you believe that the description applies *most* of the time and in *most* situations.

- | | Yes | No |
|--|--------------------------|--------------------------|
| In general, do you have difficulty making and keeping friends? | <input type="checkbox"/> | <input type="checkbox"/> |
| Would you normally describe yourself as a loner? | <input type="checkbox"/> | <input type="checkbox"/> |
| In general, do you trust other people? | <input type="checkbox"/> | <input type="checkbox"/> |
| Do you normally lose your temper easily? | <input type="checkbox"/> | <input type="checkbox"/> |
| Are you normally an impulsive sort of person? | <input type="checkbox"/> | <input type="checkbox"/> |
| Are you normally a worrier? | <input type="checkbox"/> | <input type="checkbox"/> |
| In general, do you depend on others a lot? | <input type="checkbox"/> | <input type="checkbox"/> |
| In general, are you a perfectionist? | <input type="checkbox"/> | <input type="checkbox"/> |

Location

22) Are you able to/ willing to travel to the Transport Research Laboratory (Crowthorne)?

- Yes
 No

Commitment

23) The proposed research will require a short, but weekly commitment from participants. Are you able to commit to *one hour a week for a six-week period*?

- Yes
 No

Contact details

Thank you for completing this survey and for your interest in this research. Please provide us with your contact details in the box below. If you fulfil the criteria required for the research, a member of the TRL team will be in touch with you soon with further information about the research.

24) Please provide us with the following details.

First name:

Last name:

E-mail:

Re enter e-mail address:

Phone number:

Please provide any additional information about contacting you (i.e. available times, etc)

Finish

Thank you for your interest in this research. As this is a novel and exploratory area of research, we have a specific set of selection criteria which you have not met on this occasion. However, TRL undertakes many research projects in which we often require members of public to participate.

If you would be interested in being approached by TRL for any future research, please visit our website at <https://simulatortrials.trl.co.uk/> and fill in the form. You will thereafter be included in the TRL participant database and potentially invited to participate in future studies. You may withdraw from the TRL participant database at any time.

Alternatively, you can answer the question below and provide us with your email address.

25) I would like to be contacted should other research opportunities arise relating to motorcycling.

Yes

No

Email address:

Appendix E Participant information sheet

Thank you for your interest in this research. This study was commissioned by the Institute of Advanced Motorists and is being led by the Transport Research Laboratory (TRL).

TRL is an independent private company wholly owned by the Transport Research Foundation (TRF), an independent non-profit-distributing foundation, limited by guarantee and with no shareholders. It provides impartial research, consultancy, and testing for all aspects of transport to the public and private sectors in over 145 countries.

TRL strongly believe in evidence-based research and practice, particularly relating to increasing all aspects of driver and rider safety. TRL also helps governmental and private organisations to better understand risk and to create solutions that are proven to help motorists stay safe while on the road. For more information about TRL, please visit the company's website at trl.co.uk.

This document will provide you with information about the study, and what your role would be should you choose to take part in the research. Please read this document carefully before you decide if you would like to participate.

Aims of the research

We live in a very stressful era. Stress is a very common and widespread issue. It is thought to be strongly linked to the development of illness and costs companies and our economy billions each year. According to an article in Business Matters (2012), it was estimated that Stress costs the British economy £3.7 billion per year and that more than 13 million employees are at risk of mental health problems caused by the stress of their jobs.

Stress can stem from a number of areas of life including work, family life, financial concerns, or other unpredictable life situations and can have an effect on sleep, mood, and productivity. In addition, research shows that stress of different sources can have a detrimental effect on road safety and can result in increased risk to motorists. However, even in light of this evidence, few interventions are available for stress, and even less so for driving or riding-related stress.

The purpose of this research is to evaluate the effectiveness of cognitive behavioural therapy (CBT), a widely validated intervention, for riding-related stress.

Riders are an important group as they represent less than 1% of road traffic, but 19% of all traffic collisions (particularly when statistics are adjusted for amount of miles travelled). In addition, riders may be subject to various additional stressors such as bad weather or issues with shared road space that are specific concerns to this road user group.

What is Cognitive Behavioural Therapy (CBT)?

Cognitive Behaviour Therapy is an evidence-based, Government/NICE recommended talking therapy that is widely used to help a variety of emotional difficulties across the world. Cognitive Behaviour Therapy (or CBT) looks at the relationships between the way we think and behave and how they impact on how we feel. For example, the way we think about a situation can affect the way we act. In turn, our actions can affect how we think and feel. During therapy, the client and the therapist work together to change or

alter the ways in which the client thinks or behaves, that is more helpful for them. We would like to explore how CBT can influence riding behaviour.

What can you expect from CBT?

- **Duration/Length:** Sessions tends to last one hour in total. Therapy sessions will take place in a private room, in which the therapist and client can discuss issues in confidence and openly. Sessions tend to be at the same time each week to enable momentum and continuity.
 - **Sessions will be booked at a convenient time to you, and will take place at TRL's head office (Crowthorne House, Nine Mile Ride, Wokingham RG40 3GA).**
- **Structure:** CBT is a very structured therapy. There will be a mutually agreed agenda each session, which helps to focus how the time will be used most effectively.
- **Collaboration:** CBT is a very collaborative therapy in which the client and therapist are expected to equally contribute. The therapist will provide and share helpful techniques and strategies that have been shown to be effective. The client provides their own experiences, their strengths, ways of learning and goals for therapy.
- **Continuous development:** Just as with Physiotherapy, there are "exercises" or tasks that will be required of you between sessions. The people who benefit most from CBT tend to be those who engage the most with these exercises. Therapy only makes up one hour of a 24/7 week. It is important that you try out what has been discussed during the session if you would like to see results.

What will happen if I decide to take part?

If you agree to take part in the research, you will be contacted by a member of the TRL team to book your first one-hour session with the CBT practitioner. You will also be asked to complete a number of assessments, including two questionnaires which you will complete on two occasions:

- before the beginning of your first session
- at the end of the last (sixth) session

As mentioned previously, you will also have some short 'homework' assignments to help you and the practitioner make the most out of the weekly hour session.

You and the practitioner will agree the next dates for the following sessions.

Data protection

Any data provided by participants for this research will be protected under TRL's Data Protection and Information Security Policy which covers our obligations under the Data Protection Act, Freedom of information Act and Environmental Information Regulations. Compliance is endorsed by the Chief Executive and mandatory for all employees.

The CBT practitioner is also bound by ethical standards of the profession, particularly the British Association for Behavioural and Cognitive Psychotherapies (BABCP) Standards of Conduct.

This research has been approved by the TRL Research Ethics Committee.

Incentive

Participants will be given £5 per session to go toward time and expenses involved in participating in the research. Participants will also receive a £30 bonus upon program completion.

Contact

If you have any questions about TRL or this research you can contact Kristen Fernández-Medina at kfernandez@trl.co.uk.

Appendix F **Consent form**

Participant Consent Form

Title of Project: Right mind, right ride

Researcher: Kristen Fernández-Medina, Lead researcher

Instructions: Please read the information below. If you agree with each statement, initial the box and sign. Bring this sheet in for your first session and hand it to the practitioner.

Please initial box

- | | | |
|----|--|--------------------------|
| 1. | I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. | <input type="checkbox"/> |
| 2. | I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason. | <input type="checkbox"/> |
| 3. | I agree for my sessions to be audio-recorded. | <input type="checkbox"/> |
| 3. | I agree to take part in the above study. | <input type="checkbox"/> |

Name of Participant	Date	Signature

Name of Researcher	Date	Signature

Appendix G Motorcyclist safety information leaflet

Right mind, right ride: an exploration of cognitive behavioural therapy (CBT) for the treatment of riding-related stress

As a biker you will know more than anyone the risks you face when on the road.

Sometimes the risk comes from other road users or the road itself, and other times mistakes can be made in your riding.

This leaflet is designed to provide you with some general information about the kinds of risks motorcyclists face, and some of the measures that you can take to prevent or reduce these risks.

Risk – accident involvement (DfT, 2014)

- Motorcyclists account for 19% of all road user deaths despite representing less than 1% of vehicle traffic on Britain's roads in 2013.
- Although there is generally a year-on-year downward trend on Killed or seriously injured (KSI) casualties for all road users, the rate for motorcyclists is only slightly lower (1 per cent) than the 2005-09 average.

There are some situations that are riskier than others:

The majority of motorcyclist casualties (65%) occur on urban roads, and the majority of motorcyclist fatalities (70%) occur on rural roads.

The reason for the majority of casualties occurring on urban roads is that it is on urban roads where bikers interact with other traffic, and this can result in so-called 'looked but failed to see' accidents (see below).

Fatalities are more likely to occur on rural roads because of the higher speeds involved. However, bikers are physically vulnerable regardless of where they are (see below).

'Looked but failed to see' accidents

A really common accident scenario faced by motorcyclists all around the world is when another road user (usually a car driver) violates a rider's right of way. Sometimes these accidents are called 'Looked but failed to see' accidents. This is because often car drivers claim to have looked but not seen the oncoming bike.

The majority of these accidents occur at junctions either when a car driver is either pulling out in front of a bike, or pulling across the bike's path to go into a minor road.



Another problem faced by riders at junctions is that sometimes drivers may look and see an oncoming motorcycle, but misjudge its approach speed. This is because of something

called the 'size-arrival effect'; small objects provide less information to the human eye than large objects, and the result of this is that when drivers see a motorbike coming toward them, even if they are paying full attention, their eyes will trick them into thinking that they have longer than they really do have before the bike will reach them (Horswill, Helman, Ardiles and Wann, 2005). This is one reason why sometimes drivers look, see a bike, but still pull out into its path (thinking they have more time than they really do).

Physical vulnerability

Larger vehicles like cars come equipped with many systems that are designed to reduce injury in the event of a collision (e.g. seatbelts, airbags, crumple zones). On a bike, it is much more difficult to protect the rider and even at very low speeds any collision can be extremely risky.

General safety measures

In this section we will discuss things you can do in order to minimize the risks you face as a rider (whether avoiding collisions in the first place, or trying to minimize your physical vulnerability).

Conspicuity

Conspicuity is not necessarily just about bright or retro reflective clothing, although in most situations this can help.

Although many studies show benefits of bright clothing, if the background is also brightly coloured you might still 'blend in'; don't assume drivers can see you just because your clothing is bright.

Perception – Time to arrival or Time to collision

Even if you have been seen by a car driver waiting at a junction, this does not mean that the car driver will have appraised your approach speed accurately (especially at night).

Always be on the lookout for drivers who might have appeared to have seen you, but might still pull out. Also, try to slow down a little at junctions. Although it may seem like it is other drivers' responsibility to judge your approach accurately, you can stay safe by slowing your speed to allow better appraisal. By slowing down, you will be closer to the driver pulling out for a given time to arrival. Although this may seem intuitively to be riskier, it actually helps the driver appraise your speed properly, as you will be 'bigger' (because you are closer) to the driver.

Bike safety

Any crash on a bike can be serious, so making sure your vehicle is in good condition is really important. Before each journey, make sure you conduct a pre-ride safety inspection of your bike. These will not only ensure your safety, but will help with your bike's ongoing maintenance.

The Motorcycle Safety Foundation in the United States has released a short video entitled T-CLOCS. This acronym stands for the six key safety checks bikers should carry out before any journey:

- Tires
- Controls
- Lights
- Oil
- Chassis
- Stands

The official MSF video can be viewed for free on YouTube:

<https://www.youtube.com/watch?v=YyxU1jTUz-k>

Personal Protective Equipment (PPE)

Wear a helmet.

It's not just the law, it can save your life.

- All helmets worn on UK roads must either:
 - meet British Standard BS 6658:1985 and carry the BSI Kitemark
 - meet UNECE Regulation 22.05
 - meet a European Economic Area member standard offering at least the same safety and protection as BS 6658:1985, and carry a mark equivalent to the BSI Kitemark

The Safety Helmet Assessment and Rating Programme (SHARP) can help you choose the right helmet for you.

Although wearing protective clothing is not a legal requirement, wearing the right gloves, boots, jacket, and trousers can protect you from injury, even at slow speeds.

For example, a short slide on tarmac, even at 30 mph, will shred through clothes.

For more detailed information, you can access an information leaflet produced by THINK at think.direct.gov.uk

Hazard perception (HP)

Hazard perception, sometimes described as 'reading the road', is a trainable skill which has been found to have a safety benefit (Wells et al., 2008)

- There is evidence that drivers with better HP skill have fewer accidents (Wells *et al.*, 2008; McKenna & Horswill, 1999; Hull & Christie, 1993; Quimby *et al.*, 1986), that this skill can be trained (Sexton, 2000; McKenna & Crick, 1993; Crick & McKenna, 1991), and that this may be of special benefit to inexperienced road users (Wells *et al.*, 2008)
- Motorcyclists benefit especially from avoidance of collisions due to their physical vulnerability and are less able than car drivers to rely on secondary safety systems (Horswill & Helman, 2003)

Useful websites

If you would like any more information about safety measures, including the topics covered above, you can visit any of the following websites.

- Institute of Advanced Motorists (IAM)
- THINK!
- GOV.UK
- ROSPA
- Road Safety GB

References

- Crick, J. L., & McKenna, F. P. (1991). Hazard perception: can it be trained? In G. B. Grayson (Ed.) *Behavioural Research in Road Safety II*. Crowthorne: Transport and Road Research Laboratory.
- Department for Transport (DfT) (2014, September). Reported Road Casualties Great Britain: 2013. London.
- Horswill, M. S., & Helman, S. (2003). A behavioral comparison between motorcyclists and a matched group of non-motorcycling car drivers: factors influencing accident risk. *Accident Analysis & Prevention*, 35(4), 589-597.
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- Hull, M. A., & Christie, R. J. (1993). The hazard perception test: the Geelong trial and future developments. VicRoads Report GR 93-113.
- McKenna, F. P. & Crick, J. L. (1993). A cognitive-psychological approach to driver training: the use of video technology in developing the hazard perception skills of novice drivers. In G. B. Grayson (Ed.) *Behavioural Research in Road Safety III*. Crowthorne: Transport and Road Research Laboratory.
- Quimby, A. R., Maycock, G., Carter, L. D., Dixon, R. & Wall, J. G. (1986). *Perceptual abilities of accident involved drivers*. TRRL Report RR27. Crowthorne: Transport and Road Research Laboratory.
- Sexton, B. (2000). Development of hazard perception testing. In *Proceedings of the DETR Novice Drivers Conference, Bristol*. Available at: <http://www.dft.gov.uk>.
- Wells, P., Tong, S., Sexton, B., Grayson, G. & Jones, E. (2008). Cohort II: a study of learner and new drivers. Volume 1: main report. Road Safety Research Report No. 81. London: Department for Transport (DfT).

Appendix H Questionnaires (DSI)

Rider assessment, Part I

Participant initials: _____

Session start date: _____

How many trips did you make on your motorbike this week (if you can't remember, an average is fine)? _____

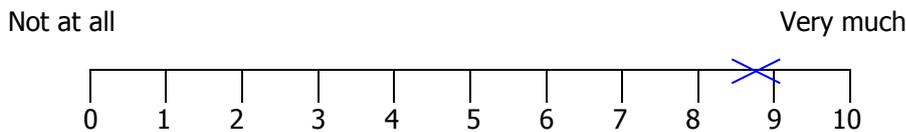
Note: travelling to and from work would count as **two trips, for example.*

Please answer the following questions on the basis of your usual or typical feelings about riding. Each question asks you to answer according to how strongly you agree with one or other of two alternative answers. Please read each of the two alternatives carefully before answering. To answer, put a cross on the horizontal line at the point which expresses your answer most accurately.

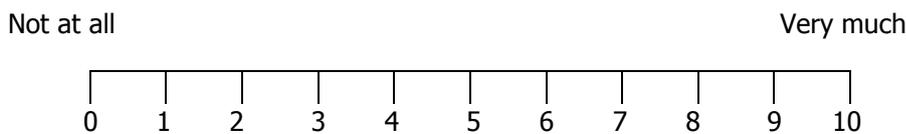
Be sure to answer all the questions, even if some of them do not seem to apply to you.

EXAMPLE: ARE YOU A CONFIDENT RIDER?

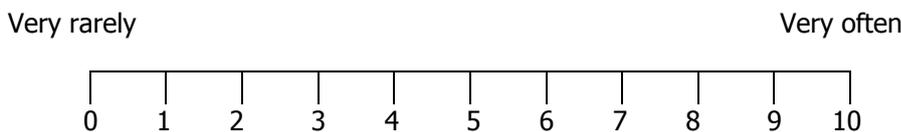
The more confident you are, the closer to the 'very much' alternative you should mark your cross. If you are quite a confident driver you might mark it like this:



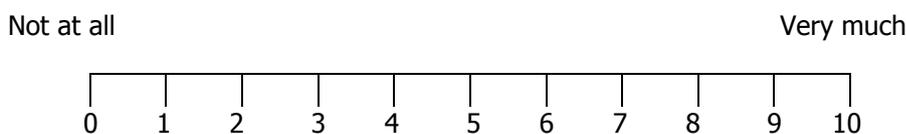
1. Does it worry you to ride in bad weather?



2. I am disturbed by thoughts of having an accident or the bike braking down?



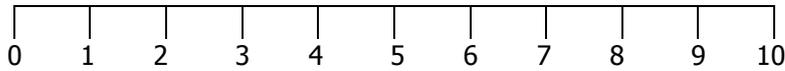
3. Do you lose your temper when another rider or driver does something silly?



4. Do you think you have enough experience and training to deal with risky situations on the road?

Not at all

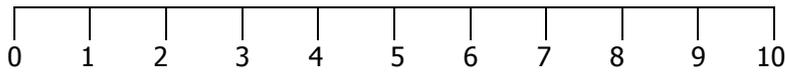
Very much



5. I find myself worrying about my mistakes and the things I do badly when riding.

Very rarely

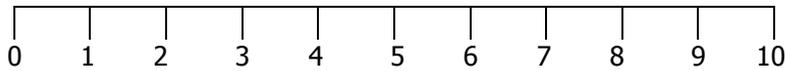
Very Often



6. I would like to risk my life as a racing motorcyclist.

Not at all

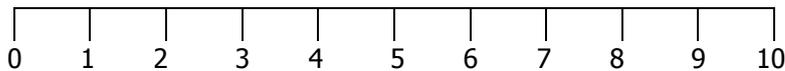
Very much



7. My driving would be worse than usual in an unfamiliar bike.

Not at all

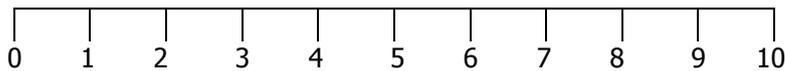
Very much



8. I sometimes like to frighten myself a little while riding.

Very much

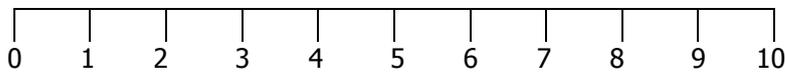
Not at all



9. I get a real thrill out of riding fast.

Very much

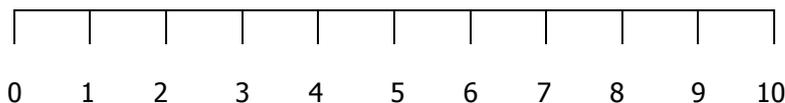
Not at all



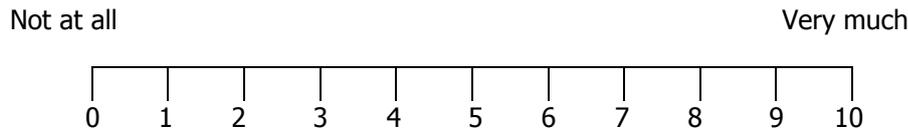
10. I make a point of carefully checking every side road I pass for emerging vehicles.

Very much

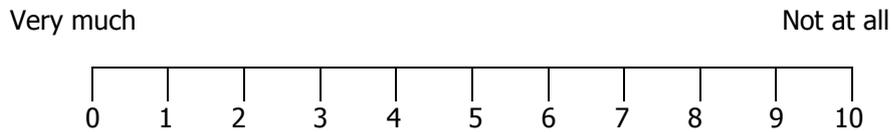
Not at all



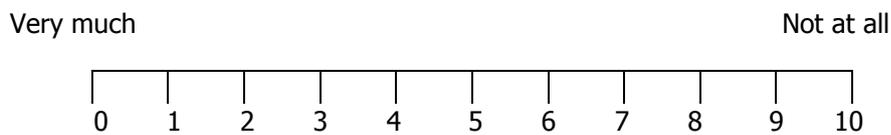
11. Riding brings out the worst in people.



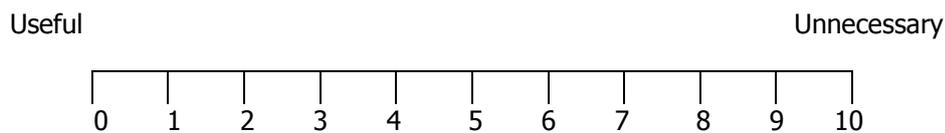
12. Do you think it is worthwhile taking risks on the road?



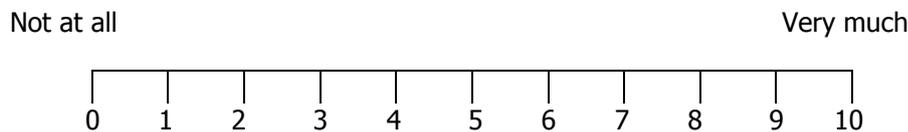
13. At times, I feel like I really dislike other riders or drivers who cause problems for me.



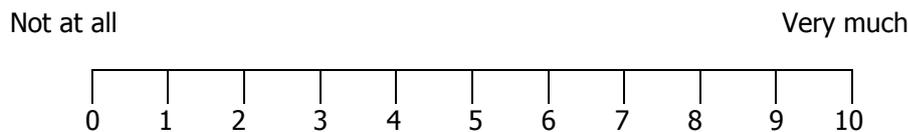
14. Advice on riding from a passenger is generally:



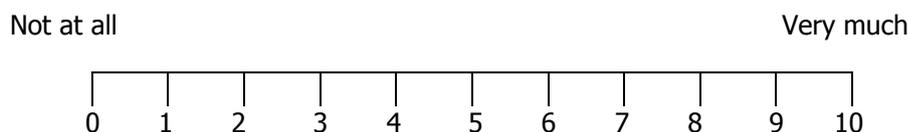
15. I like to raise my adrenaline levels when riding.



16. It's important to show other riders/ drivers that they can't take advantage of you.



17. Do you feel confident in your ability to avoid an accident?

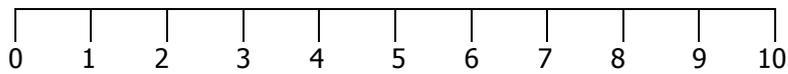


18. Do you usually make an effort to look for potential hazards when riding?



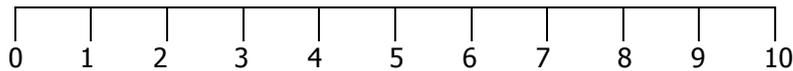
19. Other riders/ drivers are generally to blame for any difficulties I have on the road

Not at all Very much



20. I would enjoy riding a sports bike on a road with no speed limit.

Very much Not at all



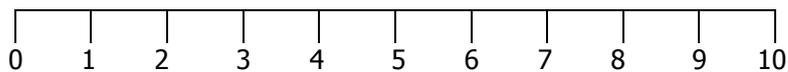
21. Do you find it difficult to control your temper when riding?

Very much Not at all



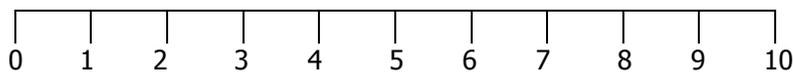
22. When riding on an unfamiliar road do you become more tense than usual?

Not at all Very much



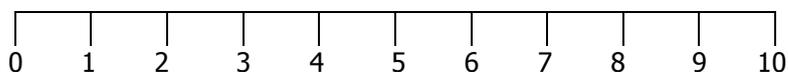
23. I make a special effort to be alert even on roads I know well.

Very much Not at all



24. I enjoy the sensation of accelerating rapidly.

Not at all Very much



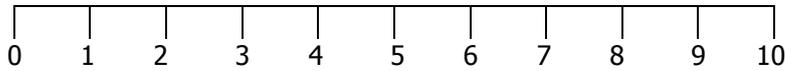
25. If I make a minor mistake when riding, I feel it's something I should be concerned about.

Very much Not at all



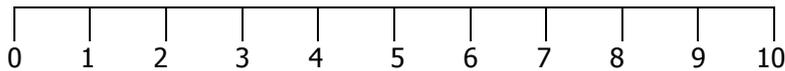
26. I always keep an eye on parked cars in case somebody gets out of them, or there are pedestrians behind them.

Not at all Very much



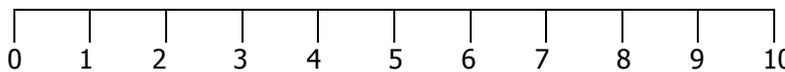
27. I feel more anxious than usual when I have a passenger on the bike.

Not at all Very much



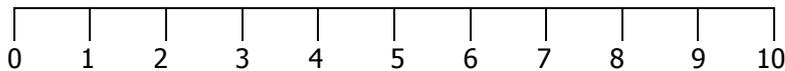
28. I become annoyed if another bike or car follows very close behind mine for some distance.

Very much Not at all



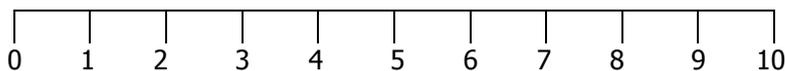
29. I make an effort to see what's happening on the road a long way ahead of me.

Not at all Very much



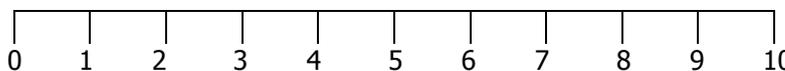
30. I try very hard to look out for hazards even when it's not strictly necessary.

Not at all Very much



31. Are you usually patient during the rush hour?

Very much Not at all

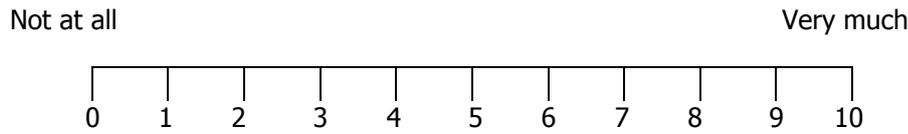


32. When you overtake another vehicle do you feel in command of the situation?

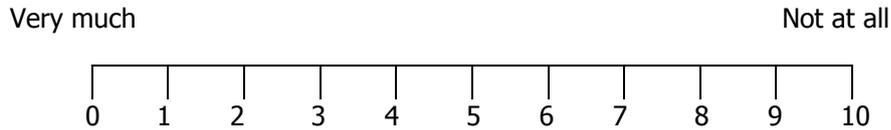
Not at all Very much



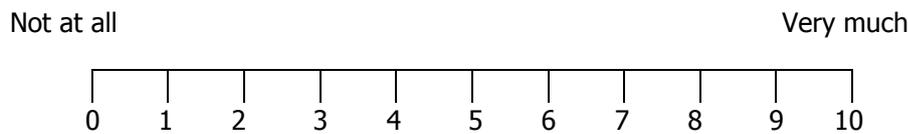
33. When you overtake another vehicle do you feel tense or nervous?



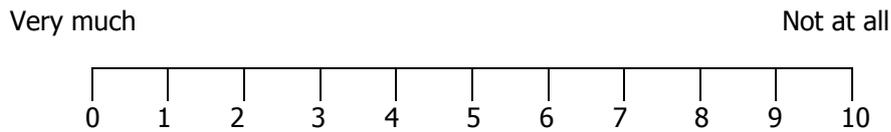
34. Does it annoy you to ride behind a slow moving vehicle?



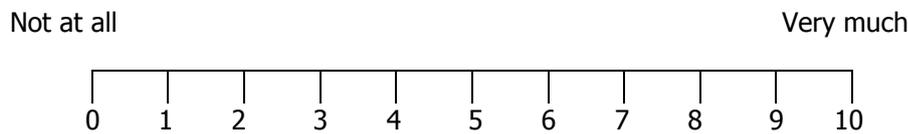
35. When you are in a hurry, other riders/ drivers usually get in your way.



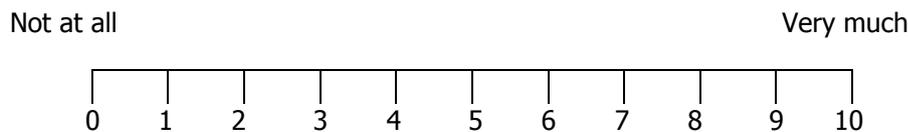
36. When I come to negotiate a difficult stretch of road, I am on alert.



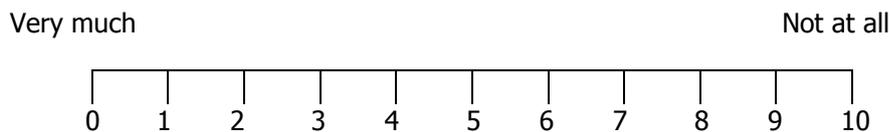
37. Do you feel more anxious than usual when driving in heavy traffic?



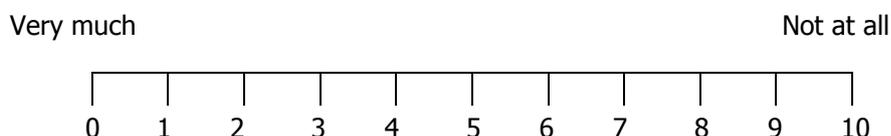
38. I enjoy cornering at high speed.



39. Are you annoyed when the traffic lights change to red when you approach them?



40. Does riding usually make you feel aggressive?



Appendix I Questionnaires (DBQ)

Rider assessment, Part II

Participant initials: _____

Session start date: _____

For the items listed below, please indicate how often, if at all, this kind of thing has happened to you by ticking the option that best describes the frequency of this behaviour.

Be sure to answer all the questions, even if some of them do not seem to apply to you.

How often do you....	Never	Hardly ever	Occasionally	Quite often	Frequently	Nearly all the time
1. Check your speedometer and discover that you are unknowingly travelling faster than the legal limit.						
2. Ride back from a party, restaurant or pub, even though you realise that you may be over the legal blood-alcohol limit.						
3. Ride as fast along country roads at night on dipped lights as on full beam.						
4. Ride especially close or 'flash' the car in front as a signal for that driver to go faster or get out of your way.						
5. Attempt to start riding without first having switched on the ignition.						
6. 'Wake up' to realise that you have no clear recollection of the road along which you have just travelled.						
7. Turn left on to a main road into the path of an oncoming vehicle that you hadn't seen, or whose speed you had misjudged.						
8. Miss your exit on the motorway and have to make a lengthy detour.						
9. Stuck behind a slow-moving vehicle on a two-lane highway, you are driven by frustration to try to overtake in risky circumstances.						

How often do you....	Never	Hardly ever	Occasionally	Quite often	Frequently	Nearly all the time
10. Intending to ride to destination A, you 'wake up' to find yourself en route B, where the latter is the more usual journey.						
11. Take a chance and cross on lights that have turned red.						
12. Angered by another driver/rider's behaviour, you give chase with the intention of giving him/her a piece of your mind.						
13. Try to overtake without first checking your mirror, and then get hooted at by the car behind which has already begun its overtaking manoeuvre.						
14. Deliberately disregard the speed limits late at night or very early in the morning.						
15. Lost in thought or distracted, you fail to notice someone waiting at a zebra crossing, or pelican crossing light that has just turned red.						
16. Misjudge speed of oncoming vehicle when overtaking.						
17. Fail to notice someone stepping out from behind a bus or parked vehicle until it is nearly too late.						
18. Get into the wrong lane at a roundabout or approaching a road junction.						
19. Fail to read the signs correctly, and exit from a roundabout on the wrong road.						
20. Fail to check your mirror before pulling out, changing lanes, turning, etc.						
21. Attempt to overtake a vehicle that you hadn't noticed was signalling its intention to turn right.						
22. Disregard red lights when driving late at night along empty roads.						

How often do you....	Never	Hardly ever	Occasionally	Quite often	Frequently	Nearly all the time
23. Drive with only 'half-an-eye' on the road while looking at a GPS, changing music, etc.						
24. Fail to notice pedestrians crossing when turning into a side-street from a main road.						
25. Get involved in unofficial 'races' with other riders.						
26. 'Race' oncoming vehicles for a one-car gap on a narrow or obstructed road.						

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