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Psychological and social factors influencing motorcycle rider intentions and behaviour

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Abstract

This report documents two studies undertaken to identify and assess the psychological and social factors influencing motorcycle rider behaviour. The primary aim of the research was to develop a Rider Risk Assessment Measure (RRAM), which would act as a tool for identifying high-risk riders by assessing rider intentions and self-reported behaviour. The first study (n = 47) involved a qualitative exploration of rider perceptions utilising a focus-group methodology. This study identified six key aspects of rider behaviour considered to influence safety: motorcycle handling skills; rider awareness; riding while impaired or not; and the tendency to bend road rules, push limits, and ride at extreme speeds or perform stunts. Study two (n = 229) was survey-based and examined the psychological and social factors influencing these behaviours, utilising the theory of planned behaviour (TPB) and other relevant psychological constructs, such as sensation seeking and aggression. This study indicated that risky rider intentions were primarily influenced by attitudes and sensation seeking, while safer intentions were influenced by perceived behavioural control. While intentions significantly predicted all six types of behaviour, sensation seeking and a propensity for aggression emerged as significant predictors, particularly for the volitional risk-taking behaviours. The measures of intention and behaviour comprising the RRAM were not found to be significantly correlated with self-reported crash involvement, possibly indicating shortcomings in the measurement of crashes. However, significant correlations were found between the components of the RRAM and self-reported traffic offence involvement. While further work is required to refine and validate the RRAM, it represents a potential tool for informing and evaluating motorcycle rider safety countermeasures.

Keywords

Motorcycle safety, theory of planned behaviour, sensation seeking, aggression

Notes

(1) ATSB reports are disseminated in the interest of information exchange.
(2) The views expressed are those of the author(s) and do not necessarily represent those of the Australian Government or the ATSB.

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EXECUTIVE SUMMARY

Background

Motorcycle riding is rapidly increasing in popularity in Australia, attracting a much wider demographic of people than in decades past. Unfortunately, whilst the overall number of road deaths in Australia has generally been reducing, the proportion of motorcycle-related fatalities has been rising in recent years. Further, the proportion of motorcycle-related fatalities in Australia is unacceptably high compared with other OECD countries. To reduce motorcycle-related fatalities on Australian roads, there is an urgent need to consider motorcyclists as distinct from other road users. This program of research facilitates the understanding of safety issues from a motorcyclist perspective and provides important information on factors influencing safe and unsafe rider intentions and behaviour.

The aims of this program of research were to:

- develop a better understanding of the psychological and social influences on rider behaviour in an Australian context;
- guide the development of future motorcycle safety countermeasures; and
- develop a tool (the Rider Risk Assessment Measure – RRAM) to inform the evaluation of motorcycle safety countermeasures, particularly in the area of training and education.

To achieve these aims, two particular studies were undertaken: a qualitative study of motorcycle rider perceptions utilising a focus-group methodology and a survey-based quantitative study of self-reported rider intentions and behaviour. Both studies were underpinned by a theoretical framework drawing on the theory of planned behaviour (TPB), identity theory, social identity theory, and other relevant psychological concepts such as sensation seeking and aggression.

Key findings

Study 1 explored motorcyclists' perceptions relating to 'safe' and 'risky' riding and the different personal and social factors that influenced their behaviour. A total of 43 people participated in this study, either as part of a focus group or as an interviewee. This exploratory process revealed six types of behaviours which were commonly believed to influence the safety (or riskiness) of motorcycle riding. These six behaviours are discussed below.

Two behaviours were identified as being particularly essential to rider safety. The first was the necessity of being able to handle the motorcycle proficiently and skilfully. The second related to the need for riders to maintain a high level of concentration whilst riding and to stay aware of the changing road environment.

In contrast, there was some debate about the inherent safety or riskiness of the two next behaviours commonly identified. Firstly, some riders believed that obeying the road rules was essential to their safety, whilst others reported that it was often necessary to break the road rules in order to stay safe. Secondly, the definition of what constituted 'riding whilst impaired' differed amongst riders. Most riders agreed that 'drinking and riding' was dangerous. However, for some, even one alcoholic drink before riding was considered dangerous, whilst others would ride after drinking provided they did not consider themselves to be over the legal BAC limit. Some riders stated that riding when

they were tired was dangerous; however, fatigue was not considered a serious safety issue for many participants.

Two further behaviours identified by participants were often associated with their accounts of crash involvement, yet not seen as intrinsically 'unsafe' by most riders. The first of these was the concept of 'pushing your limits'. Most riders interviewed appeared to enjoy pushing the limits of their ability on a motorcycle. Whilst agreeing that pushing the limits too far was dangerous, pushing them to a point that tested a rider's abilities was often reported to facilitate safety as this process developed a rider's skill. The second behaviour that was often mentioned in connection with crashes was extreme riding (e.g., performing stunts and riding at extreme speeds). The act of perfecting a stunt was often reported to result in the crashing of the motorcycle, although these crashes were usually accepted as a normal part of the learning process. Once perfected, performing stunts did not appear to be considered an intrinsically unsafe behaviour, unless performed in traffic or other unpredictable situations. A sizable minority of both male and female participants reported riding at extreme speeds. These riders often argued that they could ride extremely fast, safely, on public roads provided certain conditions were met (e.g. good visibility, minimal traffic, weather, road, and motorcycle maintenance).

Study 2 involved 229 active motorcyclists who completed a questionnaire assessing: their riding intentions and self-reported behaviour; the psychological and social factors influencing these intentions and behaviour; and their self-reported involvement in road crashes and traffic offences over the last two years. The questionnaire was structured around the six types of rider behaviour identified as important in Study 1. Key results of this study are discussed below.

In order to obtain an insight into the factors underpinning both 'safe' and 'risky' behaviour, the six areas of interest were operationalised as three 'safer' behavioural intentions (i.e. handle the motorcycle skilfully, maintain 100% awareness, not ride impaired) and three 'riskier' intentions which represented more volitional risk-taking (i.e. bend the road rules, push the limits, perform stunts or ride at extreme speeds). Hierarchical multiple regression analyses were then performed to assess the influence of different psychological and social factors on these intentions. These analyses indicated that a greater proportion of variance could be explained in the case of the riskier riding intentions [R^2 ranging from 57% – 66%] than the safer riding intentions [R^2 ranging from 22% – 36%]. The TPB construct of perceived behavioural control (PBC) significantly predicted all three 'safer' intentions, while attitude was a significant predictor of the three riskier intentions. In terms of the social influences, the TPB construct of subjective norm (which assesses the influence of others considered important) proved a relatively weak predictor of behaviour. However, the measure of specific subjective norm (i.e. the influence of the people that someone rides with) emerged as a significant predictor of three of the six intentions. Over and above this, a propensity for sensation seeking was found to be significant predictor of the three risky intentions.

Overall, a similar pattern of results emerged when the self-reported behaviours of the participants were examined. Firstly, while the various psychological and social variables examined in the study significantly predicted all six behaviours, considerably larger amounts of variance were explained for the three volitional risk-taking behaviours, i.e. bend road rules to get through traffic [R^2 = .67], push my limits [R^2 = .59] and perform stunts and/or ride at extreme speeds [R^2 = .69]. Secondly, the results were largely consistent with the tenets of the TPB, with intentions proving a significant predictor of all six behaviours. Thirdly, sensation seeking, along with rider aggression, emerged as a strong predictor of all six behaviours. Indeed, together, these two variables accounted for between 7 – 20% of additional variance in the six behaviours. Not surprisingly, these two variables accounted for relatively large amounts of additional variance in the ride while impaired [R^2 ch = .20] and the perform stunts and/or ride at extreme speeds [R^2 ch = .15] variables.

Unfortunately, no significant correlations were found between the various measures of intention and behaviour operationalised in Study 2 and the self-reported crash involvement of the participants. It

is possible that this indicates that the six behaviours of interest, in reality, do not have a close relationship with crash involvement. However, this conclusion does not seem consistent with either the findings of Study 1 or the research evidence reviewed in Chapter 2.

More likely, the findings highlight shortcomings in the size of the sample and/or the way that crash involvement was measured in the study. In particular, given that crashes are relatively rare events, crashes were measured over a two year period in order to ensure that (some) participants would have experienced a sufficient number of crashes to facilitate the analyses. However, this raises the possibility of recall problems that may have reduced the accuracy and reliability of the data, while the two year period may have been too long to accurately reflect the current intentions and behaviour of the participants.

In contrast, the majority of the intention and behaviour measures were found to be significantly correlated with self-reported traffic offence involvement. In particular, significant associations were found between self-reported traffic offences and the three 'riskier' intentions examined in the study (i.e. those relating to more volitional risk-taking, namely, bend the road rules, push my limits and perform stunts and/or ride at extreme speeds). In addition, significant associations were found between traffic offence involvement and five of the six self-reported behaviours examined (the only exception being for awareness errors). These results don't necessarily confirm the inherent 'riskiness' of the behaviours examined, since engaging in an illegal behaviour may not always result in a crash. However, they do provide prima facia evidence supporting the validity of the intention and behaviour measures developed in this study.

Strengths and limitations of the research

This program of research featured a number of strengths. Firstly, it was firmly grounded in theory; secondly, it utilised both qualitative and quantitative methods to obtain a broad insight into the factors influencing motorcycle rider behaviour; thirdly, the design of the research was informed by input from active motorcyclists; and finally, it adopted a balanced approach to motorcycle safety by examining both safe and risky riding intentions and behaviour.

Nonetheless, the program of research also had a number of limitations. Both Studies 1 and 2 consisted of participants primarily recruited from South East Queensland. In addition, the participants were volunteers who were generally older in age. As a result, the samples used in this research may not be representative of Australian motorcyclists in general, but instead reflect a subset of older, primarily recreational, riders. This should be borne in mind when interpreting the results. Furthermore, a number of other potential limitations in the Study 2 questionnaire design emerged during the analysis of the results. These included the way that fatigue was grouped with alcohol and drugs to assess intentions and behaviour relating to riding while impaired and, as noted above, the manner in which crash involvement was measured.

Implications of the research

At a theoretical level, this program of research has confirmed that the predictive utility of the theory of planned behaviour (TPB) can be substantially improved by the addition of other variables. In particular, this research demonstrated that subjective norm (SN) was a relatively weak predictor of intentions and that the specific subjective norm (SSN) (i.e. assessing the influence of those people that someone rides with) performed relatively better as a measure of social influence. Moreover, both sensation seeking and the propensity to ride aggressively proved significant predictors of all six behaviours examined, over and above the TPB and other social influence variables. The findings relating to sensation seeking are consistent with previous research in the traffic psychology area.

However, the results relating to aggression warrant more attention, since this variable proved a relatively stronger predictor than sensation seeking of the error-based behaviours (i.e. handling errors and awareness errors), the ride while impaired behaviour, and the perform stunts and/or ride at extreme speeds behaviour. This suggests that the propensity to ride aggressively has a broader influence on rider behaviour, which is not limited to the more volitional risk-taking types of behaviours.

At a practical level, this program of research has identified a number of ways to enhance current motorcycle safety countermeasures, particularly in the area of rider training and education. Most particularly, it has identified a range of psychological and social influences on rider intentions and behaviour that appear to be beyond the scope of current skills-based approaches to motorcycle training and education. Consequently, further work is required to develop and trial new approaches to rider training and education that more effectively address the attitudinal and motivational influences on riding, both of a personal and social nature.

To assist in this process, this research has undertaken the first steps in the development of the Rider Risk Assessment Measure (RRAM). This tool is intended to act as a means of identifying high-risk riders by assessing their intentions and self-reported behaviour (in relation to both 'safe' and 'risky' riding). While further work is required to refine and validate the RRAM, it represents a tool that can be used in a variety of ways to enhance motorcycle safety countermeasures, including informing the design and content of training programs and evaluating the impact of different initiatives on rider behaviour.

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- the assistance of Morgan & Wacker Motorcycle Training Centre, particularly Mr Fred Davies, in the finalisation and distribution of the Study 2 questionnaire.

GLOSSARY OF TERMS AND ACRONYMS

ABS	Australian Bureau of Statistics.
ATSB	Australian Transport Safety Bureau [formerly Federal Office of Road Safety (FORS)].
BAC	Blood Alcohol Concentration. In Australia, the legal amount of alcohol that may be present in the blood is 0.05% if the driver or rider is on an unrestricted licence. It is usually measured either by a police breathalyser or a by a blood test (see also Over the limit).
Bikie	A person who identifies with, and belongs to, an organised outlaw motorcycle club. Club members ride motorcycles and often wear jackets with 'patches' which identify the club they belong to (Veno, 2002).
Biker	A motorcycle enthusiast. May or may not belong to a motorcycle club (Krige, 1995a).
CARRS-Q	Centre for Accident Research and Road Safety - Queensland.
Cross-sectional design	A study design which collects data on the perceptions or behaviours of subjects at one point in time, as opposed to a longitudinal method which observes subjects over an extended period of time.
Driver	The operator of a motorised vehicle other than a motorcycle or moped. For example, the operator of a car, truck, or bus.
Focus Groups	Semi-structured discussion forums used to explore a variety of public, professional, and personal opinions and perceptions on a particular topic(s).
HBM	Health Belief Model.
High Risk Rider	A rider who engages in behaviours that place himself/herself, or others, in danger of death or serious injury.
High Side	A high side refers to a crash where the rider flips up into the air and over the side of the motorcycle. It is generally more dangerous than a low side crash as the motorcycle may also flip and come down on top of the rider.
Lane Splitting	Riding up between two lanes of either stationary or moving traffic.
Low Side	A low side crash occurs when the bike slips away from underneath the rider and the rider goes directly down to slide along on the ground.
MAIDS	Motorcycle Accident In Depth Study. This was a European study conducted by the Association of European Motorcycle Manufacturers (ACEM) which is included in the reference list at the back of this document (Association of European Motorcycle Manufacturers, 2004).
MAIDS team	The team of investigators working on the MAIDS study.
Motorcycle	In this study, the term motorcycle relates to motorcycles that are used on the road. Unless specified, it excludes mopeds or scooters and also motorcycles that are used exclusively for off road purposes. Motorcycles are two (or occasionally three) wheeled powered vehicles with an engine capacity which exceeds 50 cc.

- Mofa	A type of moped which is designed to travel not more than 25 kilometres per hour. It sometimes has pedals.
- Moped	Mopeds are not included as 'motorcycles' in this study. They are two (or occasionally three) wheeled powered vehicles not exceeding 50cc engine capacity and are usually designed to travel a maximum speed of 50 kilometres per hour.
- Scooter	A lightweight motorcycle with small wheels, an enclosed engine, open foot platform, and leg shields (Motor Era, 2000). Scooters are not included as 'motorcycles' in this study unless specifically mentioned. Scooters have a 'step through' design. Traditionally, scooters have had smaller engine capacities than traditional motorcycle styles. However this is changing and motor scooters are now available with much higher capacity engines.
NSW	Australian state of New South Wales.
Over the limit	When a person is over the legal blood alcohol concentration (see also BAC).
PBC	Perceived Behavioural Control (part of the theory of planned behaviour which relates to the amount of control an individual perceives they have over their actions).
Pillion	A passenger on a motorcycle, or in a sidecar. A pillion passenger should be either positioned directly behind the rider, facing forward on a registered seat for a pillion passenger, or in a sidecar. Any other carriage of pillions is illegal in Australia.
Protective clothing	Clothing, designed for motorcycle use, which reduces the severity of injuries sustained in the event of a motorcycle crash. Examples include a motorcycle helmet, gloves, boots, jackets and trousers designed for motorcycle riding. Although denim jeans would be more 'protective' than shorts, jeans would not be classed as 'protective clothing'. The only legal requirement for protective clothing in Australia is for all riders and pillions to wear a helmet which meets specific Australian standards.
Psychosocial	Involving both psychological and social aspects e.g., age, education, marital and related aspects of a person's history (Department of Medical Oncology, 2002).
QLD	Australian state of Queensland.
Q-Ride	A licensing scheme which was introduced into Queensland in 2001. It allows people the option of gaining their motorcycle rider licence by completing a competency-based training assessment process carried out by private rider training organisations.
QUT	Queensland University of Technology.
R class licence	Allows the licence holder to ride a class RE vehicle (see below) or a motorbike of unlimited engine capacity, with or without a trailer (Queensland Department of Transport, 2002, pg. 24).
RE class licence	Allows the licence holder to ride a moped, a motorbike with an engine capacity of not more than 250mL, with or without a trailer (Queensland Department of Transport, 2002, pg. 24).

Rider	The operator of a motorcycle or moped.
Road crash	A crash reported to the police that resulted from the movement of at least one road vehicle (motorised or non-motorised) on a road and involving death or injury to any person, or property damage.
- Fatal crash	A road crash resulting in the death of a person within 30 days of injuries sustained in the crash.
- Serious injury crash (sometimes referred to as a hospitalisation crash)	A road crash resulting in the hospitalisation of a person due to injuries sustained in the crash.
- Serious casualty crash	A road crash resulting in either the death (within 30 days) or hospitalisation of a person due to injuries sustained in the crash (i.e., a summation of fatal and serious injury crashes).
- Minor injury crash	A road crash resulting in the injury, but not hospitalisation, of a person due to their involvement in a crash.
- Property damage only (PDO) crash	A road crash where no one was injured but at least one vehicle is towed away or the damage cost is greater than a predetermined level (Watson, 2004, pg xxiii)
Sidecar	A capsule attached to the side of a motorcycle to carry a passenger.
SN	Subjective Norm (part of the theory of planned behaviour which relates to the influence of people who are important to the individual).
SS	Sensation seeking.
SSN	Specific Subjective Norm (an extension to the theory of planned behaviour which relates to a specific referent group. In this case, the SSN relates to the influence of people the individual rides with).
SSS	Sensation Seeking Scale (Zuckerman, 1994).
Stoppie	A stunt where the motorcycle stops suddenly to bring the rear wheel off the ground (opposite to a wheelie).
TPB	Theory of planned behaviour.
RA	Theory of reasoned action.

Unlicensed rider	A person who rides a motorcycle without a valid driver's licence, including those who: - have let their licence expire; - have been disqualified or suspended from driving; - hold an inappropriate licence for the class of motorcycle they ride; - ride outside the restrictions of a special licence; - don't currently hold a licence; or - have never held a licence (Watson, 2004).
Wheelie	A stunt where the front wheel of the motorcycle is pulled up off the ground, leaving the bike to travel on one rear wheel.
WHO	World Health Organisation.

1 INTRODUCTION

1.1 Study Aims

This program of research was motivated by an urgent need to address the safety of motorcyclists on Australian roads. Whilst progress has been made to reduce Australia's overall road toll to a level below the median of OECD countries, Australia rates relatively poorly when motorcyclist fatalities are examined separately (Australian Transport Safety Bureau, 2000; 2003a). For example, for every 10,000 motorcycles registered in 2005, there were 5.5 fatalities compared with only one fatality for registered passenger vehicles (Australian Bureau of Statistics, 2005; Tunnicliff, 2006c). In 2005, 15% of all fatalities on Australian roads were motorcycle riders or their pillions (Tunnicliff, 2006c). Of the 23 nations for which these data were reported, only five other countries (France, Greece, Portugal, South Korea and the UK) had a motorcycle fatality rate worse than Australia's (Australian Transport Safety Bureau, 2000).

The aims of this particular program of research are to:

- develop a better understanding of the psychological and social influences on rider behaviour in an Australian context;
- guide the development of future motorcycle safety countermeasures; and
- develop a tool (the Rider Risk Assessment Measure – RRAM) to inform the evaluation of motorcycle safety countermeasures, particularly in the area of training and education.

The RRAM is intended to identify high-risk motorcycle riders by measuring their intentions and self-reported behaviour. As such, a key goal of the research is to obtain an insight into the psychological and social factors influencing on-road rider behaviour, particularly those factors which increase the risk of being involved in a serious crash. Once the RRAM has been tested and validated as a reliable research tool, it will provide researchers with a means of evaluating motorcycle safety initiatives and inform the development of motorcycle safety countermeasures. Understanding the psychological and social influences on rider intentions and behaviour should also facilitate the refinement of rider training interventions and will inform other educational and enforcement initiatives.

1.2 Definition of high risk riding

An integral part of this research was to explore what motorcyclists considered 'high risk' and compare this understanding to what is commonly accepted as 'high risk' from a traditional road safety perspective. Although perceptions about the riskiness of different riding practices vary widely between individual motorcyclists (see Chapter Three for more details), the definition of 'high risk' appears to be a commonly understood concept. For the purposes of this research, 'high risk' or 'risky' riding will be used to describe rider intentions and behaviour that may lead to fatal or serious injury crash involvement for the motorcyclist, their pillion passenger, or other road users. By definition, a high risk rider does not need to have experienced a serious crash; he or she simply needs to be at a 'high risk' of having one. Identifying common underlying psychosocial influences that are associated with risky riding behaviour provides another, albeit indirect, means of identifying a high risk rider.

1.3 The rationale for this research

Motorcycles have always been one of the riskiest forms of transport on Australian roads; however, until quite recently, they have received minimal attention in the road safety arena. The reason for this appears to be two-fold; low absolute numbers and difficulty accessing the population.

First, motorcycle riders make up only a small proportion of road users - approximately 3% of registered vehicles are motorcycles (Australian Bureau of Statistics, 2003). Consequently, motorcycle-related fatalities and serious injuries number less than those of car drivers and passengers even though they are over-represented on a registration/licensing basis. If we accept that road safety initiatives aim to save as many lives as possible, then it makes sense that both research and funding has been largely targeted towards minimising car crashes.

Second, motorcyclists are a harder population to engage in research. Obtaining a representative sample of motorcyclists is difficult (Harrison & Christie, 2003; Haworth, Mulvihill & Simmons, 2002; Turner & McClure, 2004). Motorcyclists are not an homogenous group, although the non-motorcycling public have often perceived them to be so (Krige, 1995a). Anecdotal evidence collected during this study, and also by Krige (1995a) and Veno (2002), suggests that the public now differentiate between 'bikies ' and 'bikers ', but in reality, the world of motorcycling has a much more complex social structure than this simple dichotomy. Different segments of this social structure are easier to access and more willing to engage in research than others. These issues are discussed in further detail in Section 2.3.4.

As motorcyclist safety is a relatively small area of road safety research, limited research tools to assess motorcyclist attitudes, intentions and behaviours exist. The few studies that have attempted to explore the psychosocial aspects of motorcyclist behaviour have tended to use modified versions of existing scales that were developed for driver research and many have been developed for the UK which differs markedly from Australia in climate and road conditions (Sexton, Baughan, Elliott & Maycock, 2004). As the experience of motorcycle riding differs markedly from driving a car, specialised research tools are warranted.

This study will begin to address this gap in the research by providing better insight into the psychosocial factors influencing rider intentions and behaviour. In particular, those intentions and behaviours that increase a rider's risk of being involved in a serious crash. This study will elicit motorcyclists' opinions on safe and risky riding to provide an exploratory approach to the development of the RRAM.

The RRAM will assist researchers to measure high risk riding behaviour and the psychosocial factors that contribute to it. This tool will assist researchers to evaluate the impact of motorcycle safety initiatives at both the process and outcome levels and will inform the development of motorcycle safety countermeasures. Further, it is hoped that a better understanding of the psychosocial aspects of rider intentions and behaviour will facilitate the refinement of rider training interventions. In addition, the more knowledge that can be disseminated to riders about the processes which contribute to either safer or more risky riding, the more riders can use this knowledge to make positive changes in their riding style, if necessary.

1.4 Theoretical framework for the research

An extended version of the Theory of Planned Behaviour (TPB) is used as the basis for this research (Ajzen, 1985, 1988, 1991). In addition to attitudes, subjective norms, perceived behavioural control, and intentions which form the TPB, items to explore social identity theory, identity theory, and sensation seeking constructs were also included.

A full explanation of the rationale for this approach, along with a discussion of other theoretical perspectives that are commonly used in road safety, is provided in Section 2.5.

1.5 Demarcation of scope

This study examines the determinants of intentions and behaviour among motorcycle riders who ride on public roads in Australia. It will provide an important foundation on which to base future quantitative research into Australian motorcyclists. Whilst it is acknowledged that the behaviour of other road users (in particular car drivers) has a marked influence on the number and severity of motorcycle crashes, this issue is beyond the scope of this particular research project. However, the need to address driver behaviour towards motorcyclists is an urgent one, and is an important area for further research.

Off-road riding has not been included in this study as initiatives to research and improve off-road safety are likely to differ significantly from those targeting on-road riding. Therefore, crashes that riders may have had whilst riding off-road are not included in this study.

Motorcycles have not been operationalised in this study to include mopeds or scooters (except where explicitly indicated) as these types of vehicles are almost exclusively used in urban environments, and represent a specific sub-population of motorcyclists. Some measures of risk relevant to standard motorcycles could be argued as irrelevant for these kinds of vehicles due to the differences in vehicle design and usage. Given the likely differences in handling, performance, usage, type of crash, injury patterns, and age/gender demographics of the riders, a separate study into the road safety issues relevant to these types of motorcycles is warranted.

1.6 Outline of report

The structure of this report is as follows.

Chapter Two draws on published literature and official data sources, including crash data, to examine issues pertaining to motorcyclists and their safety. The prevalence of motorcycling in Australia is reviewed, along with facts pertaining to the general Australian motorcycling population. This overview is followed by a discussion of issues relevant to motorcycle crashes, focusing on who crashes motorcycles, crash types, and the human errors which are responsible for most crashes. A section on theories applicable to motorcycle safety research is then presented, followed by a discussion and rationale for choosing the theory of planned behaviour. At the end of the chapter, the research questions underpinning this program of research are identified and discussed.

Chapter Three provides the methodology and results of an exploratory focus group study (i.e., Study 1). This study informed the development of the questionnaire used in Study 2. The perceptions and experiences of motorcyclists and relevant interested parties, such as police and rider trainers, in relation to safe and unsafe riding were investigated using a framework structured around the theory of planned behaviour, social identity, self identity, moral norm and causal attribution.

Chapter Four provides a description of the methodology, administration, and analysis of the RRAM (i.e., Study 2). The results of the analysis are presented, focusing on a theory-based exploration of six major areas of rider behaviour. This study examines whether a person's intentions to perform these behaviours can be predicted by a range of psychosocial determinants. It then goes on to examine whether rider intentions actually predict their on-road behaviour.

Chapter Five discusses the results of this program of research in terms of the research questions identified at the end of Chapter Two. The implications for road safety, contribution to theory, and future directions for research in this area are also discussed.

2 METHOD

2.1 Introductory comments

This chapter examines issues pertaining to motorcyclist safety in Australia and presents the rationale for this particular program of research by considering both Australian and overseas literature and exploring relevant data sources.

First, in Section 2.2, basic patterns of motorcycle use in Australia are presented. Although information on how many active riders there are in Australia and how many motorcycles are registered is presented, difficulties in obtaining accurate estimates (particularly for active riders) are discussed, including a brief overview of the problems of using licensing data. The issue of unlicensed riding is also introduced.

Section 2.3 reviews what is currently known about the characteristics of Australian motorcyclists. It explores changing patterns in motorcycle usage; provides a basic demographic profile of Australian riders; presents factors related to youthfulness which are suggested to predict later motorcycle riding; and includes a brief discussion of the social structure of motorcycling.

Section 2.4 reviews the road safety literature for information on factors which contribute to crashes, the prevalence and nature of crashes and injuries, and then discusses differences between crash-involved motorcyclists and the information presented in Section 2.3 relating to the general motorcycling population.

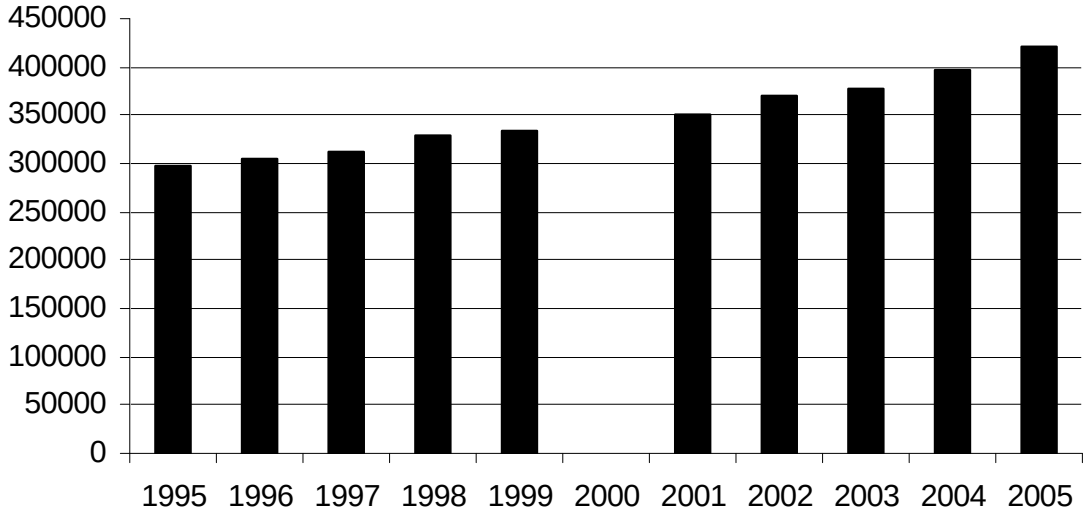
Section 2.5 examines theoretical perspectives that have been used to explore road user behaviour and which may be relevant to risk-taking research amongst the motorcycling population.

Section 2.6 provides a summary of the chapter and a rationale for the choice of theoretical perspective adopted in the present research. In concluding the chapter, the research questions used to guide this program of research are presented.

2.2 The rise of motorcycling in Australia

Motorcycles are fast increasing in popularity; it is estimated that around 5% of the Australian population are active riders (Krige, 1995b). In 1995, there were 296,628 motorcycles registered in Australia, representing 2.7% of all registered vehicles (excluding plant equipment, caravans and trailers) (Australian Bureau of Statistics, 1997). As shown in Figure 1, by 2005 this figure had increased by 42% to 421,923, representing 3.03% of all registered vehicles. In the five years between 2000 and 2005, motorcycles showed the strongest growth of any vehicle type in Australia (Australian Bureau of Statistics, 2004b).

Figure 1. Number of motorcycles registered in Australia, 1995 – 2005

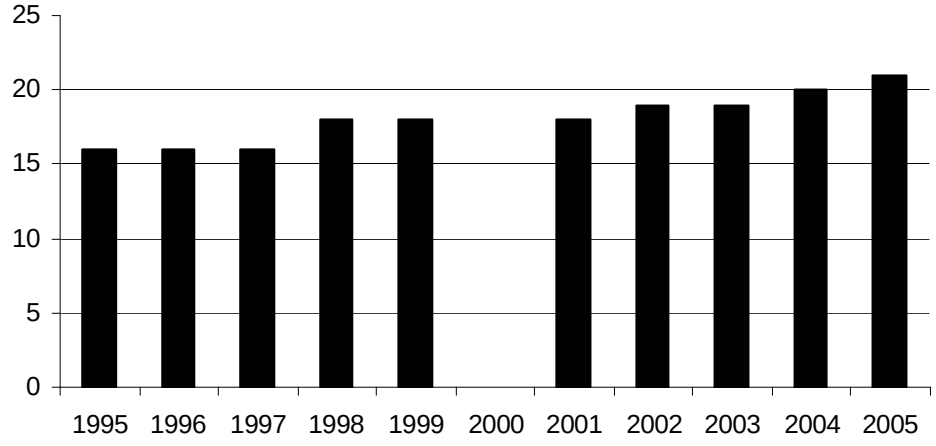


Source: Australian Bureau of Statistics Motor Vehicle Census 9309.0

Note. There were no data available for 2000.

Similarly, as shown in Figure 2, the number of motorcycle registrations is also increasing in real terms as a proportion of Australia's population. In 1995, approximately 16 motorcycles were registered for every 1000 residents in Australia whereas by 2005 this figure had increased to approximately 21 motorcycles per 1000 residents.

Figure 2. Number of motorcycles per 1000 resident population, Australia 1995 - 2005



Source: Australian Bureau of Statistics Motor Vehicle Census 9309.0

Note. There were no data available for 2000.

As this is a study of on-road motorcycle riders, registration data provides useful baseline information; however, the automotive industry estimates that almost as many motorcycles in Australia are unregistered as registered, although most of these unregistered vehicles are likely to be used predominately or solely off-road (Federal Chamber of Automotive Industries, 2005).

Licensing data

Using licences on issue as a proxy for actual riding is problematic. For instance, in March 2005 there were 48,196 female motorcycle licence holders and 358,070 male licence holders (excluding learners) in Queensland. However, only 99,528 motorcycles were registered in the State at the time (Queensland Department of Transport, 2005). Even allowing for a sizable proportion of unregistered motorcycles, or licensed riders who ride other people's motorcycles, the figures strongly indicate that many people keep their motorcycle licence long after they stop riding. This conclusion is supported by the findings of a survey of people aged over 30 years who held motorcycle licences in Victoria. Only 53% of those surveyed had ridden within the past 12 months (Haworth et al., 2002).

2.2.1 The issue of unlicensed riding

There is also good evidence that unlicensed riding is common in Australia. Although off-road riding may account for some of the 16-20% of unlicensed riders identified in Krige's (1995b) study, Krige states that it is likely that a significant proportion of these unlicensed riders do ride on the roads. This suggestion is of concern as unlicensed riders and drivers have a higher crash involvement than licensed operators (Association of European Motorcycle Manufacturers, 2004; Christie & Harrison, 2002; de Rome, Stanford & Wood, 2002; Harrison, 1997a, 1997b; Haworth, Smith, Brumen & Pronk, 1997; Kraus et al., 1991; Watson, 2004).

Watson (2004) found evidence to suggest that unlicensed, or inappropriately licensed, riding may be a significant problem on Australian roads and that unlicensed riding may be much more prevalent than unlicensed driving. Watson (2004) examined serious casualty crashes in Queensland from 1994-1998 and found that, within the licensed population, approximately 10% of all crashes involved a motorcycle; however, amongst the unlicensed population almost 30% of crashes involved a motorcycle. Haworth, Smith et al. (1997) presented a lower estimate, suggesting that approximately 6% of the riding population is underage, unlicensed or unregistered; however, 17% of crashes can be attributed to this population.

Unlicensed riding and riding unregistered motorcycles appears to be more prevalent amongst younger Australians (Krige, 1995b). Haworth, Ozanne-Smith, Fox and Brumen (1994) studied 174 Victorian riders and 11 pillions aged under 21 years who were either fatally injured or admitted to hospital. Although off-road crashes predominated in this study, over 40% of those involved in on-road crashes were not licensed. Also, over 30% of the on-road crashes occurred on an unregistered motorcycle. These riders were also much less likely to be wearing a helmet or protective clothing and many had previously been injured on a motorcycle. Haworth et al. (2002) report that older riders (aged over 30 years) are less likely to be unlicensed than younger riders. NSW crash and casualty data for 2000 showed that unlicensed riders made up 18% of motorcycle fatalities, 8% of motorcycle crashes and that most of these riders (61%) were under 26 years of age. In addition, these unlicensed riders were more likely to be speeding and at least 8 times more likely to be riding under the influence of alcohol at the time of the crash (de Rome et al., 2002). Haworth et al. (2002) report Victorian figures which suggest that unlicensed riders involved in crashes are more likely to have a BAC reading higher than the legal limit of 0.05 than licensed riders. There is also some evidence to suggest that females may be more likely to ride unlicensed than males and that unlicensed riding is more common amongst the rural population (Krige, 1995b).

Unlicensed riders pose challenges for safety interventions as they are a 'hidden' population and, therefore, difficult to access. As mentioned above, exact numbers are unknown and these riders often only come to the attention of authorities if caught by police or if seriously injured; however, the data available suggest that unlicensed riding may be quite prevalent within Australia.

2.3 Profile of motorcyclists

The Australian motorcycling population has changed markedly in recent years. The most noticeable changes relate to the broadening social demographics of motorcyclists. An increase in popularity over recent years has seen people of all ages and social strata taking up motorcycling either as a hobby or as a mode of transport (de Rome & Stanford, 2002; de Rome et al., 2002; Krige, 1995b). Although motorcycles make up only around 3% of the registered vehicles on Australian roads, the number of kilometres travelled is comparatively lower than other forms of transport, lending weight to evidence that motorcycle riding is more of a recreational pursuit than a primary mode of transport for many people (Krige, 1995b).

As shown in Table 1, a recent survey conducted by the Australian Bureau of Statistics shows that motorcycles account for less than 1% of kilometres travelled by Australian vehicles (Australian Bureau of Statistics, 2004a).

Table 1. Percentage of kilometres travelled on motorcycles compared with other vehicles in the 12 months ending 31 October 2003, by age and gender

	15-24yrs	25-54yrs	55+ yrs	Total [b]
Males	**%**	**%**	**%**	**%**
Motorcycles	0.06	0.46	0.06	0.59
Other vehicles	3.93	39.57	16.44	61.69
Females [a]				
Motorcycles	0.02	0.06	0.001	0.08
Other vehicles	3.55	21.71	6.73	32.71
Persons				
Motorcycles	0.08	0.52	0.06	0.70
Other vehicles	7.49	62.10	23.93	99.30

Note a: Original data sourced from the 2004 ABS Catalogue no. 9210.0.55.001 Survey of Motor Vehicle Use. The Relative Standard Error for female motorcyclists (34%) is high, meaning that these data may be unreliable, probably due to lower numbers of female motorcyclists providing an insufficient sample. However, this is the best data available and whilst the specific percentages quoted may not be completely accurate, the trends shown are supported by other data sources (see section 2.3.1 below).

Note b: Missing age data account for the percentages under 'Total' not matching the cumulative percentages for each age category and missing gender data account for the total persons figure not matching the cumulative total of males and females.

2.3.1 Gender

Motorcycles are ridden predominantly by males whilst pillions are predominantly female (Christie & Harrison, 2002; Haworth, Smith et al., 1997). Examining the 2003 gender data presented in Table 1, males travelled approximately 88% of the total kilometres travelled by motorcycles, whilst females travelled approximately 12%. These data correspond with Queensland licensing records which indicate approximately 12% of all motorcycle licences in Queensland (excluding learners permits) are held by females, and 88% by males (Queensland Department of Transport, 2003a,

2005). Although, as detailed earlier, the number of licences on issue should not be used as a proxy for the number of people actively riding motorcycles, a similar examination of NSW motorcycle licences on issue in 2002 showed approximately 90% were held by males and 10% by females (Roads and Traffic Authority, 2003). Compared to 1999, the proportion of female licence holders had increased by only 1% (i.e., by around 3400 licences), confirming that motorcycles remain a male-dominated mode of transportation (Roads and Traffic Authority of NSW, 2000). These data differ from Harrison and Christie's (2003) exposure study of NSW motorcyclists, which found that men travelled around 30% more kilometres than women (median 3,637 km compared with 2,760 km); however, only 7% of their sample was female and, of these, only a handful were under the age of 30 years.

A 1995 national survey of 200 Australian motorcyclists showed 13% of riders were female. Women were more likely to be unlicensed than men, were less likely to own the bike they rode and more likely to ride only for recreational purposes (Krige, 1995b). The study also found that female riders almost always had a partner who rode. This fact may be important in considering female riding behaviour. A recent Victorian survey of motorcyclists found that women over the age of 30 years made up 17% of new riders; however, only 6% had been riding continuously for many years and only 4% had returned to riding regularly after a period of inactivity (Haworth et al., 2002). This pattern may reflect the different reasons women ride, and/or may also be indicative of a growing interest in motorcycling amongst older women. In Queensland, as at 31 March 2005, 23% of all motorcycle learners permits on issue were held by women (Queensland Department of Transport, 2005).

Considering the data from these sources, there is no doubt that motorcycle riding in Australia is dominated by males although it appears that the proportion of female riders may be increasing. The exact ratio of current riders who are male to those who are female is not certain, although using the sources explored above, an estimate of 88% male riders to 12% female appears to be reasonable.

2.3.2 Age

As mentioned previously, it is difficult to ascertain exactly who rides motorcycles; however, more accurate data are available for motorcycle casualties. Age estimates derived from motorcycle licence holders appear inaccurate, as discussed earlier. For example, Queensland licence data shows that 6% of licence holders are over 70 years old, whilst only 3% are under the age of 25 (Queensland Department of Transport, 2003a).

Haworth, Smith et al. (1997) collected comparative information from motorcyclists riding in the same Melbourne areas and at the same time of day that a previous crash had occurred (as part of a case-control study), thereby providing a sample of what may be interpreted as 'normal road use' by motorcycle riders in that area. Although 1195 control riders were included in the study, only 563 were spoken to by the researchers. The other 632 did not, or could not, stop safely to provide information. Of the 563 interviewed, age information was collected from all except one. The age breakdown of the participants showed 22% were under the age of 25 years, 47% were aged between 25 and 34 years, and 31% were aged 35 years or older. Although Haworth, Smith et al. suggest that this sample may be biased by an over-representation of recreational riders on smaller capacity bikes, it still appears to be one of the best estimates of the age distribution of riders currently available in Australia.

Krige's (1995b) sample of 200 Australian motorcyclists included 29% under the age of 25 years, 15% were aged between 25 and 29 years, a further 15% aged 30-34 years, 17% aged 35-39 years, and 25% aged over 40 years of age. Interestingly, in Krige's sample, 19% of the under 25 year olds were female.

2.3.3 Predictors of motorcycle use

Data from a New Zealand birth cohort study examined predictors of male motorcycle use at age 18 years. The strongest predictor was early illegal riding (at 13 years), followed by lower than average reading levels, having had a fight in a public place, and a tendency to attribute their health to 'chance' or 'luck' (Reeder, Chalmers, Marshall & Langley, 1997). However, the motorcyclists in this study were not a homogenous group and those who rode on the road most frequently were the least deviant. The other groups included off-road riders or pillion passengers and infrequent (often unlicensed) on-road riders.

As the current research is primarily focused on motorcyclists who ride on the road, predictors for this group were examined. According to Reeder et al. (1997), the only significant predictors for the frequent on-road riders were having ridden frequently on the road at age 15 years, and having poorer reading skills. As Reeder et al. (1997) used a correlation-based methodology, it is possible that their findings represent covariation between these variables and later on-road riding rather than any direct causal link.

2.3.4 The social structure of motorcycling

Motorcyclists are not a homogenous group. This section provides an introduction into the complex nature of the motorcycling community, and illustrates how this complexity can act as a barrier to research in this area.

Krige's (1995a; 1995b) studies provide some of the most in-depth descriptive information on the social nature of motorcycling in Australia. Motorcyclists in her sample were fairly evenly distributed between white (37%) and blue (44%) collar workers. Only 12% belonged to any form of motorcycling club; however, over half the sample (54%) stated that they sometimes rode in a group. According to Krige (1995a), a kind of 'mateship' exists between motorcyclists, largely because of the negative attitudes the rest of the community hold towards motorcyclists.

The motorcyclists in Krige's (1995a) study identified 5 distinct groups of motorcyclists which they generally described as follows:

- The 'Outlaws': usually a member of an organised criminal-type 'patch' gang. They ride in groups and ride for the lifestyle, not necessarily for the love of riding. They reflect the stereotypical 'bikie' image and usually ride Harleys or large European bikes;
- "Boy Wonders": often young and inexperienced, do not usually belong to a club, but ride because they love the challenge and push their limits, race their peers and often do not consider the consequences of their behaviour. They usually ride fast, high powered, Japanese bikes;
- "Dirts": Ride off-road bikes. They often belong to a club, and it is not uncommon for the activity to be a family event with involvement of siblings, fathers etc;
- "Commuters": Ride for practical reasons (economy, easy parking etc.) rather than the love of riding. They often have conservative bikes, do not belong to a group, and drive the family car on weekends; and
- "Weekend Warriors": Club enthusiasts, often new to riding. They are typically older, with higher incomes, and looking for a hobby. Made up of many sub-groups such as the HOGS (Harley Owners Group), the Europeans (own European bikes), and the Ulysses (over 40s).

If the description of these groups is even generally accurate, then it is clear that each of these groups has a different social profile and requires different strategies to sample for research purposes.

Also, research into motorcycle safety generally shows that the older riders, passionate about motorcycles, are more willing to participate in research than younger people or those who use their motorcycle for commuting or practical purposes (de Rome et al., 2002; Harrison & Christie, 2003; Haworth et al., 2002).

2.4 Characteristics of motorcycle crashes

There have been many studies investigating various aspects of motorcycles crashes, both in Australia and overseas. This section examines some of the factors identified as relating to motorcycle crashes as well as the types of crashes in which motorcyclists are involved.

2.4.1 Speed

Speed is the most frequently cited factor contributing to motorcycle crashes in the literature. There is evidence that motorcyclists do indeed travel faster than car drivers (Horswill, 2001; Horswill & Helman, 2003) and that younger people travel faster than older road users (Fildes, Rumbold & Leening, 1991; Fitzgerald, Harrison, Pronk & Fildes, 1998; Harrison, Triggs & Pronk, 1999; Stradling, Meadows & Beatty, 2004), regardless of their experience (Lajunen & Summala, 1997). A study of novice versus experienced young drivers indicated that, when novice drivers feel they are in a competitive environment, they make rasher speed choices than their more experienced counterparts (Delhomme & Meyer, 1997). The effect of competitive environments on young riders may be worth examining given that so many ride, at least sometimes, within a group situation.

Haworth, Smith et al. (1997) investigated 222 motorcycle crashes in Victoria between November 1995 and January 1997. Approximately 80% of the crashes took place in an urban location, and 49% took place at an intersection. Excessive speed for the conditions was deemed to have been a rider contributory factor in 35% of single vehicle and 17% of multi vehicle crashes. Inappropriate positioning, ineffective braking, and failure to respond were the main rider faults found. However, this level of detail could only be coded for 128 crashes. For almost one third of these crashes, there was no contributory rider error attributed. Little difference was found in the type of crash between experienced and inexperienced riders with approximately 70% impacting with an object or vehicle, 27% losing control, and 3% falling to avoid an impact.

Self reported crash information collected from a survey of NSW motorcyclists indicated that excessive speed for the conditions was associated with 12% of multi vehicle crashes and 14% of single vehicle crashes (de Rome et al., 2002). The difference in the travelling speed of motorcycles compared to surrounding traffic was found to be a direct contributory factor in 66% of crashes involving a motorcycle in a recent European study of motorcycle crashes (MAIDS team, 2004).

2.4.2 Alcohol and other drugs

In Australia, there is no evidence to suggest that motorcyclists are more likely to drink and ride than car drivers are to drink and drive. Drink-riding, like drink-driving, remains a serious problem for motorcycle safety as operating a vehicle under the influence of alcohol increases a person's risk of having a serious crash (National Health and Medical Research Council, 2001). A Victorian analysis of killed or seriously injured riders and drivers concluded that, over the 10 year period from 1984 to 1993, motorcyclists were less likely to be over the legal BAC limit than other road users (Diamantopoulou, Brumen, Dyte & Cameron, 1995). Queensland data from 1997 to 2002 suggests that motorcycle fatalities are no more likely than other road users to have a positive BAC reading (Queensland Department of Transport, 2003b).

Another 10 year study (1990-1999) of alcohol and drugs present in driver fatalities found that 29% of fatally injured motorcyclists, compared with 30% of fatally injured car drivers, were over the 0.05 legal limit. However, 22% of the motorcyclists had cannabis in their system compared with 11% of the car drivers, although other impairing drugs, such as opioids, stimulants, and benzodiazepines, were less likely to be found in the motorcyclists (Drummer et al., 2003). In Western Australia, an analysis of motorcycle fatalities in 1999 found that of the total (n = 17), 2 had cannabis in their system, 2 had amphetamines, 1 had benzodiazepines, and 2 had other therapeutic (including prescription) drugs in their systems' - a total of 41% who may have been affected by drugs, compared to 33% of driver fatalities. Poly-drug users were coded by the drug that had the highest concentration in their system so are not double-counted (Kirov, Legge & Rosman, 2000).

A USA study found that 32% of motorcycle riders admitted to a trauma centre in the early 1990s tested positive for THC (a test for a chemical constituent of cannabis), compared with just 3% of car drivers. Also, motorcycle riders were significantly more likely to have alcohol in their systems than car drivers (47% vs 35%) and slightly more likely to have other illicit drugs present such as cocaine and PCP (Soderstrom, Dischinger, Kerns, Mathias & Trifillis, 1996). These findings may reflect cultural differences between motorcyclists in the USA compared with those in Australia.

A New Zealand cohort study (Begg, Langley & Stephenson, 2003) found that those who persistently drink and drive a car were also more likely to have held a motorcycle licence at age 18 years. Interestingly, holding a motorcycle licence at 18 years of age was the only discriminating variable for the female drink-drivers in this study. Males who persistently used cannabis and drove were significantly more likely to have held a motorcycle licence at 18 years of age. A motorcycling history was not associated with females who frequently drove after using cannabis. The results of this study do not prove that motorcyclists are more likely to drink and drive or use drugs. They do, however, raise the question of whether there may be a subset of motorcyclists which generally engages in a high risk lifestyle. This tendency towards a high risk lifestyle was supported by another New Zealand cohort study (Fergusson, Swain-Campbell & Horwood, 2003) where the group of young car drivers identified as being most likely to be involved in traffic crashes were also found to engage in substance abuse and criminal activity and to have friends who behaved similarly.

A South Australian analysis of blood samples taken from 2500 injured drivers and riders in 1995 and 1996 found that motorcyclists were significantly more likely to have THC alone in their system (5%) than car drivers (2%), although car drivers were slightly (although not significantly) more likely to have almost every other drug or combination of drugs in their systems (Longo, Hunter, Lokan, White & White, 2000a). The presence of THC alone was not shown to have any relationship with culpability in the crashes, although the concentrations of most of the sample were very low so it is quite possible that higher levels may indeed result in an increased crash risk (Longo, Hunter, Lokan, White & White, 2000b).

A UK study found motorcyclists who crashed were significantly more likely to ride after drinking and to break the road rules (Rutter, Quine & Chesham, 1990). Haworth, Smith et al.'s (1997) case control study of Victorian motorcyclists found that crashed riders were significantly more likely to have a BAC over the legal limit (13% of crashed riders compared with 1% of controls) and that illicit drugs (mainly cannabis) had been used in the past 24 hours by 6% of crashed riders and 3% of controls. Interestingly, around two thirds of the crashed riders who had used illicit drugs had also consumed some alcohol within the same period. This mix of drugs and alcohol is of concern as an investigation of fatal single vehicle crashes in Victoria determined that the combination of alcohol and cannabis increased the crash risk of drivers and riders to a level greater than alcohol alone. It was unclear whether this was due to a cumulative effect of cannabis on top of alcohol, or to an interactive effect between the two drugs (Haworth, Vulcan, Bowland & Pronk, 1997).

As riding a motorcycle effectively requires greater psychomotor skills than driving a car (for example, balance and coordination are vital), it has been argued in the USA that motorcyclists

should have a lower legal BAC limit than car drivers as crash involvement occurs at lower mean BAC levels for motorcyclists compared with car drivers (Sun, Kahn & Swan, 1998). Evidence suggests that any alcohol in a rider's system increases risk taking behaviour as Haworth, Smith et al. (1997) found excessive speed to be a factor in almost half the cases where the rider's BAC was above zero. They also found that males were more likely to ride with alcohol and/or illicit drugs in their system than females. Although young drivers may not be directly comparable with young riders, 71% of male and 51% of female drivers in the New Zealand cohort study reported that, between the ages of 18-21 years, they drove a car within four hours of drinking alcohol (Fergusson et al., 2003). In Australia, the trend in alcohol consumption amongst the younger population is of concern as there has been a rapid increase, particularly amongst young females (Chikritzhs et al., 2003). From 1990-1997, more than half of all serious alcohol-related road injuries were sustained by people aged less than 25 years (National Health and Medical Research Council, 2001).

2.4.3 Road conditions

Poor Australian road surfaces have been identified as a contributing factor in motorcycle crashes and are often mentioned by motorcyclists as an area where the government can take action to reduce motorcycle crashes (de Rome et al., 2002; Haworth, 1999). It is difficult to ascertain the extent to which poor roads contribute to serious or fatal crashes as this is not systematically reported in official Australian statistics. Haworth, Smith et al. (1997) noted that the road surface was muddy, oily, or strewn with loose material in 27% of serious and fatal crashes they studied, and that many more sites had irregular or changing surfaces. On further investigation, Haworth (1999) concluded that the condition of the road, mainly "lack of visibility or obstructions, unclean road or loose material, poor road condition or road markings and horizontal curvature" (pg. 3), actively contributed to around 15% of the crashes.

A survey of NSW motorcyclists reported that 67% of single vehicle and 44% of multi vehicle crashes were associated with loss of traction due to poor road conditions. In almost 80% of these cases, the riders reported there was 'nothing they could do' to prevent the crash (de Rome et al., 2002). Whilst two-wheeled vehicles are more vulnerable to losing traction on poor road surfaces than four-wheeled vehicles, the extent to which road surfacing problems directly cause crashes is uncertain. For example, NSW official data indicate that the road surface is not usually associated with crashes (de Rome et al., 2002, p. 7). It could be argued that better rider training in observation, hazard avoidance, and road positioning (for example) may reduce this problem (Haworth, Symmons & Kowaldo, 2000). Other rider-controllable factors, such as choice of speed and issues of fatigue or drug and alcohol intake, may also reduce these types of crashes (Haworth, Smith et al., 1997). Better roads would undoubtedly prevent a number of crashes; however, roads in good condition still get oil, mud, or other debris on them and motorcyclists require strategies for dealing with these hazards.

2.4.4 Crash types

In the early 1990s, a parliamentary inquiry into motorcycle safety in Victoria was conducted. According to this inquiry, around 31% of motorcycle crashes where a rider or pillion was killed or injured were classified as single vehicle crashes; however, many hospitalised riders reported that had been run off the road by another (unidentified) vehicle. The committee noted that at least one third of single vehicle crashes were the rider's fault and could be reduced through better rider training (Road Safety Committee, 1993). Both urban and rural multi vehicle crashes were examined by the inquiry. The majority of urban crashes occurred at intersections where, in approximately three quarters of the cases, the motorcyclists had right of way. In rural areas, the majority of collisions were head-ons, followed closely by intersection crashes.

A study of motorcycle crashes in the USA showed five types of incidents accounted for 86% of fatal crashes in 1992 (Preusser, Williams & Ulmer, 1995). Although the analysis uses American data which is over a decade old, the broad crash typology is highly relevant to current Australian crash trends. In Australia, different States and Territories have different crash reporting mechanisms. No Australian study could be located that provided a comprehensive, national typology of crashes. Therefore, in the next sections, the five major fatal crash types determined by Preusser et al. (1995) will be used to examine the available Australian and international data.

Table 2. Main causes of fatal motorcycle crashes and main party "at fault", USA 1992

Reasons for fatal motorcycle crashes	Crashes	Primarily 'at fault'
The rider runs off the road, overturns or strikes an off-road object	857 41.3%	Rider (≈ 98%)
A vehicle with an obligation to stop or give way doesn't	375 18.1%	Other driver (≈ 66%)
Head on crashes	225 10.8%	Rider (≈ 73%)
One vehicle turns across the path of another	176 8.5%	Other driver (≈ 99%)
The rider loses control and comes off the motorcycle	152 7.3%	Unknown

Note. The % figure under the Primarily 'At Fault' column relates to the proportion of crashes where the driver/rider error was recorded. As this could not be calculated from the full sample, they are approximate. (Source: Preusser et al., 1995).

2.4.4.1 Riding off the road

As shown in Table 2, the most common type of fatal motorcycle crash recorded in this American study involved the motorcyclist running off the road (Preusser et al., 1995). Of these, 71% occurred on a curve and were often due to excessive alcohol, or riding too fast for the conditions. The Haworth, Smith et al. (1997) study, conducted in Victoria, determined 25% of fatal crashes and 33% of injury crashes were single vehicle crashes. Excessive alcohol was present in 26% of single vehicle crashes compared with 10% of multi vehicle crashes and around 70% of all crashes occurred on a curve (although some of these sites were also intersections). Official fatality statistics over the 16 year period 1989 – 2004 show that 41% of riders and pillions killed in Australia were involved in single vehicle crashes (Tunnicliff, 2005). The Haworth, Smith et al. study determined around 27% of 222 injury and fatal crashes were from a loss of control, whilst around 1.5% fell off trying to avoid an impact with a moving car. This small percentage does not support the assertion that many Australian single vehicle motorcycle crashes may actually be the result of the motorcycle being run off the road by another, unidentified, vehicle (Road Safety Committee, 1993). However, data from a NSW survey indicated that 27% of all crashes were the result of the rider trying to avoid a situation created by another vehicle (de Rome et al., 2002).

Christie and Harrison (2002) found that running off the road accounted for approximately one third of all motorcycle crashes in NSW between 1990-2000. Similarly, another NSW study (de Roos, Rouse & Walker, 2002) reported that over one third of motorcycle crashes were single vehicle, including around 32% riding off the road on a curve between 1997-2001.

Similar statistics have been recorded for Victoria (Road Safety Committee, 1993). New Zealand statistics show that approximately 43% of fatal and 27% of injury crashes in 2002 involved a loss of control either on the straight or whilst cornering (Land Transport Safety Authority, 2003). American analysis of single vehicle fatal motorcycle crashes spanning 1990-1999 showed that over 80% of crashes occurred off the road (e.g., the shoulder, median, roadside, in a parking lane) and of these more than half were related to speeding (Shankar, 2001). Further, approximately half of all single-vehicle motorcycle fatalities occurred as the rider was negotiating a curve. The Federal Office of Road Safety (1999) report that 75% of fatal single vehicle crashes where the motorcycle rider was not over the legal blood alcohol limit nor unlicensed, ran off the road.

The information provided in this section demonstrates how difficult it is to quantify the proportion of Australian riders that simply 'run off the road'; however, the evidence does suggest that this type of crash accounts for a significant proportion of all crashes, with alcohol and excessive speed more likely to be contributing factors than for other crash types. None of the studies available reported whether crashed riders were riding with other motorcyclists at the time of the incident so it is impossible to determine whether peer influence or competitive behaviour may be a factor in these types of crashes.

2.4.4.2 Failure to give way

According to Preusser et al. (1995), failure to give way is the second most common form of fatal motorcycle crash. In around two thirds of cases, the motorcyclist has the right of way and another vehicle (usually a car) fails to stop or give way (see Table 2). One possible explanation for this could be that motorcycles are particularly vulnerable to 'look but fail to see' errors (i.e., where the driver of another vehicle looks in the correct direction but fails to see the person or vehicle that they collide with) (Brown, 2001). According to Brown, 'looked but failed to see' errors contribute close to 10% of all motor vehicle crashes and are more likely to occur in complex situations, such as intersections. Brown lists three reasons likely to explain 'looked but failed to see' crashes. First, as a driver or rider scans a complex environment for a safe gap in the traffic, experience will dictate what the driver perceives as a hazard, and what can be ignored as non-hazardous. These drivers, according to Brown, may be more likely to crash into vehicles that behave unexpectedly. Second, drivers may use a single criteria (such as proximity) to determine a hazard and, therefore, may be more likely to collide with vehicles that were initially further away, but travelling quickly. Third, drivers may scan a complex environment too quickly and either misjudge speed, distance, or the orientation of a vehicle, or may even integrate features from different vehicles, effectively 'seeing' one vehicle when there may be two. Unfortunately, this issue is difficult to address as most drivers believe that they possess superior hazard perception skills compared with other drivers, and so do not perceive a need for enhancing this skill (Horswill, Waylen & Tofield, 2004).

Research has shown that people riding motorcycles tend to ride in a more risky fashion than if they were driving a car; overtake more frequently; and travel faster (Horswill, 2001). Therefore, it is possible that motorcycle riders may behave unexpectedly, travel faster and therefore appear unexpectedly; or may be not be identified due to their size, lane location, or speed of approach, all increasing the likelihood of 'look but failed to see' crashes. Australian statistics suggest that in multi vehicle crashes involving a motorcycle, the rider is 'at fault' less than half the time (41%). Excessive speed by the motorcyclist, however, is a factor in over half the multi vehicle crashes (Federal Office of Road Safety, 1999). A study of Victorian motorcycle crashes judged the motorcycle rider contributed to around two thirds of multi vehicle crashes by inappropriate positioning or failure to respond (Haworth, Smith et al., 1997).

The issue of conspicuity has also been addressed by Wells et al. (2004) who found that wearing reflective clothing, a lighter coloured helmet, or turning on headlights all had a protective influence, reducing the likelihood of motorcycle crashes.

A recent review of day-time running lights in both Australian and international settings showed that this initiative has had a protective effect for motorcycles (Cairney & Styles, 2003).

2.4.4.3 Head on crashes

Preusser et al. (1995) report that head on crashes were the third most common form of fatal motorcycle crash in the USA in 1992, accounting for 10.8% of fatal crashes (see Table 2). The 2002 New Zealand statistics show 5% of injury and 17% of fatal motorcycle crashes were attributed to head on collisions (Land Transport Safety Authority, 2003). Whilst little has been written on the factors surrounding motorcycle head on collisions, according to Preusser et al., it is usually the rider who crosses into oncoming traffic. It is, therefore, possible that this type of crash is largely the same as 'riding off the road'; however, instead of continuing to travel off the road, the rider collides with oncoming traffic. The Preusser et al. findings support this suggestion as their research showed that head-on crashes, like running off the road crashes, are more likely to occur in rural areas, on higher speed roads, and on curves.

2.4.4.4 One vehicle turns across the path of another

Situations where one vehicle turns across the path of another, thereby causing a crash, made up around 8.5% of fatal crashes in Preusser et al.'s (1995) study (see Table 2). From the information available, Preusser et al. concluded that this type of crash was almost always the fault of another vehicle, rather than the motorcycle rider. This high 'at fault' rate of other drivers suggests that type of crash may be another example of 'look but fail to see' errors as discussed earlier. Crashes occurring at an intersection made up 49% of the crashes investigated in the Haworth, Smith et al. (1997) study, and at least 50% of crashes involved an impact with a moving vehicle. The crash specifics are not reported so it is impossible to determine from this literature if one vehicle turned across the path of another. Only 14% of riders involved in a crash with another vehicle agreed they were solely at fault in the crash, most (70%) judged the other party at fault; however, the researchers estimate that the rider was faultless in only one third of multi vehicle crashes (Haworth, Smith et al., 1997).

2.4.4.5 Rider loses control and comes off the motorcycle

A Victorian study found that around 21% of fatal motorcycle crashes occurred when the rider lost control and fell off their motorcycle, a further 4% fell off whilst trying to avoid an impact (Haworth, Smith et al., 1997). The Preusser et al. (1995) study placed around 7.5% of fatal crashes into this category, although the circumstances surrounding these types of crashes were not reported. Different categorisation practices may account for the large percentage difference between the Preusser et al. and Haworth et al. studies as the Australian study does not differentiate between riding off the road and other loss of control. However, it is also possible that the nature of fatal crashes in Australia do differ to those in the USA.

2.4.5 Common rider errors

More recently, the Motorcycle Accident In Depth Study (MAIDS)(Association of European Motorcycle Manufacturers, 2004) reviewed 921 fatal or injury motorcycle and moped crashes which occurred in 5 European countries (France, Germany, the Netherlands, Italy and Spain) between 1999 and 2000. Of these, 523 cases fell into what this study categorises as a 'motorcycle'. Although a European study, at least some of the patterns of crash causation should be useful in understanding Australian crash patterns.

For example, in only 32% of multi vehicle crashes was the motorcycle rider primarily at fault. Perhaps, more surprisingly, in only 66% of single vehicle crashes was the rider primarily at fault (MAIDS team, 2004). Despite this, the data indicate that there were many cases where the rider may have been able to avoid or minimise the crash (regardless of 'fault') if he/she had been paying better attention, scanning the traffic better, allowing for visual obstructions or traffic hazards, travelling at a more appropriate speed for the conditions, or simply undertaking a better traffic strategy (e.g., leaving appropriate following distance).

In the cases that the motorcycle (or other powered two wheeler) rider was primarily at fault, errors in decision making accounted for almost 35% (see Table 3). The MAIDS team deemed that, in these cases, the rider "failed to make the correct decision to avoid the dangerous condition" (Association of European Motorcycle Manufacturers, 2004 p. 29). They give the example of a rider noticing a light turning yellow, yet continuing on the same path, at the same speed, and running into car moving perpendicular to them. Approximately 32% of errors were identified as failures of 'perception', meaning that the rider failed to detect the dangerous condition. For example, failing to check before moving lanes and crashing into a car already in that lane would be classified as 'perception' error.

Table 1. Type of rider error when crash was deemed primarily caused by the rider rather than another party or factor

Identified failure	Single vehicle crash		Multi vehicle crash		Total	
	n	%	n	%	n	%
Decision	22	23	98	40	120	35
Perception	27	28	83	34	110	32
Reaction	20	21	31	13	51	15
Comprehension	8	8	25	10	33	10
Other	18	19	9	4	27	8
Total	**95**	**100**	**246**	**100**	**341**	**100**

Data sourced from tables sent from the MAIDS team in an email communication to Deborah Tunnicliff on 10 November, 2004. It includes all powered two wheel vehicles including motorcycles, mopeds, and mofas.

Reaction failures accounted for around 15% of crashes where the rider was primarily at fault. These errors describe situations where the rider fails to react to a dangerous situation. Comprehension failures are where the rider failed to comprehend the danger associated with the situation (Association of European Motorcycle Manufacturers, 2004). Australian data collected by Victorian researchers (Haworth, Smith et al., 1997; Haworth et al., 2000), identified the most common contributory errors to crashes were ineffective braking, inappropriate positioning, failure to respond, and poorly maintained motorcycles.

2.4.6 Injury and fatality statistics

The rise in popularity of motorcycling is worrying from a road safety perspective. In terms of both vehicles on register and kilometres travelled, Australian motorcyclists and their pillions are at least 10 times as likely to die or be seriously injured as car drivers and their passengers. As at March 2005, there were 421,923 registered motorcycles in Australia compared with approximately 10.9 million passenger cars (Australian Bureau of Statistics, 2005).

Fatalities in 2005 included 233 motorcyclists and pillions and 1133 drivers and passengers (although this figure includes some drivers and passengers of vehicles other than passenger cars) (Tunnicliff, 2006c). These statistics indicate that, for every 10,000 registered passenger cars, one person was killed in 2005, whereas for every 10,000 motorcycles registered, 5.5 people were killed. If the number of kilometres travelled is taken into account, the relative risk of incurring a fatal injury whilst riding a motorcycle, compared to travelling in a car, has been reported as 28 times greater (Australian Transport Safety Bureau, 2005). Although serious injury figures for 2005 are not currently available, 4439 people travelling on motorcycles and 12,196 people travelling in passenger cars were seriously injured in the year ending June 2003 (Australian Transport Safety Bureau, 2004). Similarly, Christie and Harrison (2002) reported a casualty risk for motorcyclists 16-18 times higher than passenger cars using a sample of NSW and Victorian riders.

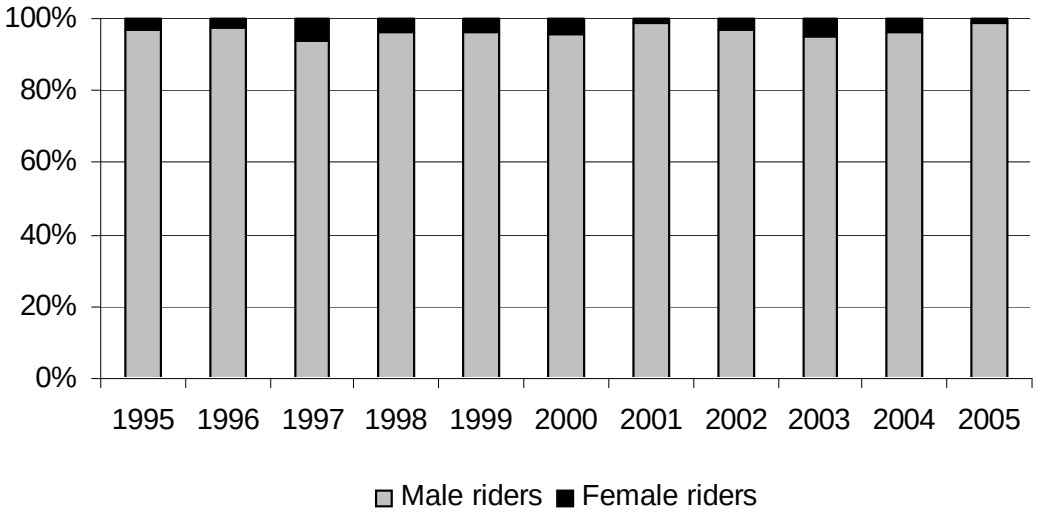
Whilst these data suggest that motorcyclists are more likely to be involved in reported on-road crashes than car drivers, the data do not take account of unreported crashes. If a motorcyclist is involved in a crash, serious damage to the bike, personal injury, or death is much more likely than if they were in a car. Therefore, motorcycle crashes may have a greater likelihood of being recorded in the official statistics than other vehicle crashes, introducing a possibility of bias. Nevertheless, there is good evidence to suggest that riding a motorcycle is riskier than driving a car.

The Hurt Report (Hurt, Ouellet & Thom, 1981), which was one of the earliest comprehensive assessments of motorcycle crashes, states that 98% of multiple vehicle crashes and 96% of single vehicle crashes result in some kind of injury to the motorcyclist. Although there has been improvement in the design of motorcycles since 1981 to increase their safety, and Australia has compulsory helmet laws (both of which would reduce these percentages) the likelihood of injury from a motorcycle crash remains undeniably higher than in a car. More recently, an Australian study found that around 50% of motorcycle crashes were fatal or severe, compared with around 35% other vehicle crashes (Diamantopoulou et al., 1995). In addition, a parliamentary inquiry into motorcycle safety in Victoria in 1993 was told that approximately 56% of motorcyclists injured in crashes are either killed or hospitalised compared with around 30% of other injured road users (Road Safety Committee, 1993).

2.4.6.1 Injury by gender

From 1 July 2002 to 30 June 2003, there were 4090 (92%) male motorcyclists seriously injured in road crashes in Australia compared with 349 (8%) females (Australian Transport Safety Bureau, 2004). However, the fatality data presented in Figure 3 show that, on average, 96% of the rider fatalities over the 11 year period 1994-2004 were male. If the estimates of the gender distribution for riders (88% male vs. 12% female) discussed in section 2.3.1 are accurate, then males are overrepresented in the injury statistics.

Figure 1. Rider fatalities by gender, Australia 1995-2005 (% and actual number)



Source: (Tunnicliff, 2006a)
Note: These data do not include pillion passengers.

Although Harrison and Christie (2003) caution on the representativeness of their sample, their data suggest that men may actually travel around 30% more on their motorcycles than females. Sexton et al. (2004) also found that male riders in the U.K. generally report higher mileage than female riders.

If males do travel further than females, it could be argued that any overrepresentation of males in the crash statistics reflects a higher exposure (i.e., they are actually on the road more and, therefore, exposed to the possibility of a crash more often). However, Harrison and Christie (2003) found no significant difference in crash rates per kilometre travelled between males and females. What they did find was that riders who had very little exposure (less than 1000km per year) had crash rates around eight times higher than the sample average. Inconclusive results regarding exposure were also found by Sexton et al. (2004), as they were unable to determine whether increased mileage resulted in a higher risk of crashing, or if riding in all weather conditions (including the UK winter) was responsible. Haworth, Smith et al. (1997) did not find greater on-road exposure was associated with an increase in crash risk; however, they did find that more years riding experience reduced the risk slightly.

2.4.6.2 Injury of pillions compared with riders

The ATSB fatal crash database shows that, over the 11 years from 1995 to 2005, there were 1992 male riders and 47 male pillions killed compared with 69 female riders and 71 female pillions (Tunnicliff, 2006c). Haworth, Smith et al. (1997) found that pillions significantly increase the crash risk of riders, suggesting either the resulting higher centre of gravity or inappropriate behaviour on the part of the pillion may contribute to this. The MAIDS report found that, of crashes where the rider was carrying a pillion, the pillion directly contributed to the crash in at least 9% of cases, had no effect in 86% of cases, and any effect was unknown in 9%. They also found that pillions were significantly more likely to not wear a helmet, and, in general, were less likely to wear protective clothing than riders (Association of European Motorcycle Manufacturers, 2004).

2.4.6.3 Injury by age and experience

Evidence clearly shows that young riders are at a higher risk of crashing than older riders. Fatality data from 2000 to 2005 showed 375 (30%) of motorcyclists or pillions killed were aged 25 years or under (Tunnicliff, 2006b). Using the estimates provided in section 2.3.2 Age, it appears this age group may be overrepresented in the fatality statistics. A New Zealand study found that riders over the age of 25 years had less than half the risk of younger riders to be moderately to fatally injured (Mullin, Jackson, Langley & Norton, 2000).

Haworth, Smith et al. (1997) also found that young riders under the age of 25 years were overrepresented in crashes. These young riders were more likely to be students or receiving a benefit rather than in full or part time work and more likely to have never been married and not in a de facto relationship.

Rutter and Quine (1996) attempted to disaggregate the issues of youthfulness and experience in motorcycling in a UK study. They found that youthfulness, per se, played a much greater role in crashes than inexperience. Rutter and Quine concluded that young people showed a greater willingness to break the law and generally ride in an unsafe manner which, in turn, leads to crash involvement. These findings are supported by Haworth, Smith et al. (1997) and Haworth et al (2000) who found that 55% of crashed riders in their study were inexperienced compared with 45% of control riders (although, the odds ratio for this factor was not significant). Mullin, Jackson, Langley and Norton (1998) also found that, although five years riding experience appeared more protective than two, once age was accounted for, inexperience was no longer associated with motorcycle injuries.

These findings that youthfulness, more than inexperience, is related to crashes are also supported by the body of evidence which links youthfulness with risk taking generally (Eby & Molnar, 1998; Fergusson et al., 2003; Jessor, Turbin & Costa, 1997; Jonah, 1997a; Jonah & Dawson, 1988) and with wider developmental factors such as moral and cognitive maturity (Eby & Molnar, 1998; Jessor et al., 1997). These findings are consistent with studies of sensation seeking which show that sensation seeking typically peaks around the late teens and dissipates with age (see section 2.5.5.2 for a more detailed discussion on this topic.) There is also some evidence to suggest that people, and in particular young males, tend to overestimate their skill on the road (DeJoy, 1992; Horswill et al., 2004; Svenson, 1981).

Maycock (2002) performed statistical modelling of driver statistics to disaggregate the effects of age and experience and found that whilst age had an independent effect, inexperience was deemed a larger contributor to crashes than youthfulness, per se. These results were particularly striking amongst young drivers aged 17-21 years and suggest that the age of the driver is less predictive of crash risk than whether the driver was a novice or experienced. Maycock (2002) also found the independent effect of age on crashes more pronounced amongst young males than females.

A New Zealand cohort study found that 95% of male and 86% of female drivers aged 21 years reported they had engaged in at least one form of risky driving behaviour (most commonly speeding 20km or more over the limit) in the time since they were 18 years old (Fergusson et al., 2003). Adjusting the data for experience and exposure did reduce crash risk; however, it was the number of risky driving behaviours that participants engaged in that was most strongly related to crashes (Fergusson et al., 2003).

Victorian licence data indicate that there is an increasing uptake of motorcycling in people aged over 30 years, whereas the number of licence holders aged under 30 years has remained fairly constant. Riders over 30 years old had only one third the crash rate of younger riders, and crash involvement appears to decrease with age (Haworth et al., 2002). Inexperienced riders aged over 30 years were found to have more crashes than experienced riders of the same age, but fewer than either experienced or inexperienced younger riders (Haworth et al., 2002).

However, the fact remains that this increasing uptake equates to greater numbers of older riders being injured or killed on Australian roads (Diamantopoulou et al., 1995; Haworth et al., 2002).

The Motorcycle Accident In Depth Study (MAIDS) found that 12% of European motorcycle riders who had been involved in crashes were aged 21 years or younger (whereas this figure reached almost 60% for the mopeds and mofas group). Also, riders in this age group were much more likely to be primarily at fault in crashes compared with older riders. Around 17% of motorcyclists who had crashed were aged between 22 and 25 years, whilst 50% were aged between 26 and 40 years, and 18% were aged between 41 and 55 years. Only 2% of these motorcyclists were aged over 55 years (Association of European Motorcycle Manufacturers, 2004).

2.4.6.4 Type of injury

When seriously injured (rather than killed), the main injuries sustained by motorcyclists tend to be to the legs (38%); arms (30%); trunk (18%); and head and neck (12%). In contrast, drivers with serious injuries are usually admitted to hospital for head and neck injuries (39%) and injuries to the trunk (33%). (Australian Transport Safety Bureau, 2003b). These figures reflect the lack of physical protection (other than head protection from helmets) that motorcyclists and their pillion passengers have if they come off the motorcycle.

A NSW survey of motorcyclists found the most common kinds of injury reported by motorcyclists were sprains, bruises and gravel rash. Undoubtedly some of these types of injuries could be lessened or prevented by adequate protective clothing. However, only 45% of riders and 35% of pillions reported that they usually covered their legs with good protective clothing, although almost all (over 90%) wore a protective jacket (de Rome et al., 2002).

2.4.7 Summary of characteristics of motorcycle crashes

There is strong evidence to suggest that riding a motorcycle is associated with a higher risk of injury or death than driving a car. The design of a motorcycle provides the rider with little protection in the event of a crash compared to that provided by a car and, undoubtedly, this fact contributes to this higher risk of injury. Whilst maintaining control of a motorcycle on defective road surfacing or in poor weather conditions is more challenging than what is usually experienced in a car, the human factors which contribute to many crashes (such as excessive speed for the conditions, the presence of alcohol and/or other drugs, as well as decision, perception, and/or handling errors) probably provide a better explanation for the higher crash rates of some types of riders compared to others, after accounting for differences in exposure.

Young people are generally more likely to speed and engage in risk taking behaviour than older people and this is particularly true for young males (Fergusson et al., 2003; Fitzgerald et al., 1998; Stradling et al., 2004). Inexperience may also be a contributing factor to crashes, however amongst young people this may be of less influence than a general willingness to engage in high risk behaviours (Fergusson et al., 2003; Rutter & Quine, 1996; Sexton et al., 2004). It is possible that being young has a greater independent effect on crashes amongst riders rather than drivers. First, a much greater proportion of riders are male and, according to Maycock (2002), age plays a larger independent role in crash risk amongst males than females. Second, the social dynamics of riding could mean that perceived peer pressure to exhibit risky behaviours is greater. Third, the physical dynamics of a motorcycle allow more 'stunt' type behaviours than are possible in a car. Finally, riding a motorcycle safely may require more complex cognitive processes (e.g., hazard perception skills, strategic planning) than car driving. Factors such as these have been shown to be an influence in crashes and risky behaviour amongst young car drivers (Delhomme & Meyer, 1997;

Horvath & Zuckerman, 1993; Summala, 1987) and may go some way to explain why young riders, in particular young male riders, have such high motorcycle crash rates.

Whilst many young riders may be inexperienced, there are also a substantial number of older people either taking up riding motorcycles for the first time or returning to riding after years of riding inactivity. There is little evidence to suggest that returning riders are more at risk than people who have been riding for years; however, new riders in the older age groups do appear to be at greater risk of crashing than their more experienced counterparts (Haworth et al., 2002; Sexton et al., 2004). The trend of increasing crashes amongst older motorcyclists may, at least partly, be explained by inexperience; but appears to be mainly due to a substantial increase in the number of older riders (Haworth & Symmons, 2002).

Riding after alcohol and/or drug consumption remains a significant problem on Australian roads, especially as it seems possible that even a small amount of alcohol may increase a rider's risk of crashing on a motorcycle and may contribute to risk taking behaviour (Haworth, Smith et al., 1997). Whilst the association between alcohol and crashes has been well established, the relationship between illicit drug use and motorcycle crashes is less clear. It appears that a combination of alcohol and other drugs is more risky than alcohol alone; therefore, it is quite plausible that using illicit drugs may adversely affect a rider's ability to handle their motorcycle to the best of their ability (Haworth, Vulcan et al., 1997).

The previous sections outlined many common types of crashes and rider errors. Sexton et al. (2004) found a relationship between rider errors leading to crashes and an 'enthusiastic' riding style and argued that the reasons people choose to ride motorcycles (such as the pleasure of riding and an enjoyment of speed) are strongly correlated with why they crash. Further, there seems to be a reasonable amount of evidence to suggest that there may be subsets of motorcyclists, particularly amongst young riders, who generally engage in risk taking behaviour and are therefore at much greater risk of crashing than others. For example, the unlicensed rider who also rides under the influence of alcohol, and rides at excessive speed for the conditions. Further, the young drivers that adopt a generally high risk lifestyle mix with like-minded peers (Fergusson et al., 2003), so it may be important to consider the whole peer group when designing interventions.

This section has discussed many of the factors which contribute to motorcycle crashes. The evidence presented in the preceding sections suggests that a person's willingness to engage in high risk or dangerous riding behaviour may be an important determinant of subsequent crash involvement. It also highlighted that, as riding is often a social activity, it may be useful to develop a better understanding of the dynamics of group riding and the influence of the people a person rides with on behaviour. A better understanding of the underlying psychosocial mechanisms which are associated with both safer and high risk riding behaviours may be facilitated by using a theoretical perspective to examine the issue. In particular, theory may give some insight into the underlying factors which affect a person's willingness to engage in safe or risky behaviours.

2.5 Theoretical perspectives applicable to motorcyclist behaviour

Whilst understanding the causes of motorcycle crashes (e.g., speed, reckless riding behaviour, conspicuity issues) assists in the development of initiatives aimed at reducing crashes, the role of theory in this context can play a pivotal role in not only explaining, but predicting, and ultimately changing the behaviour that leads to crashes.

Theory can provide a basis for understanding the underlying psychosocial mechanisms inherent in risk-taking behaviour and, most importantly, the means for changing these. Theory enables targeted strategies to be put in place which have predictable (theorised) outcomes. If the theory is sound, interventions can be developed with the knowledge that they are reasonably likely to result in behavioural change and, therefore, play a protective role in preventing such crashes from ever occurring. For this reason, this research has been guided by a strong theoretical framework.

Road safety research typically uses a multidisciplinary approach, drawing on disciplines as diverse as psychology, information technology, and engineering. As this particular program of research is to determine factors relating to riders' intentions and behaviour, theoretical perspectives used in existing studies of motorcyclist and driver behaviour were considered for their applicability to this research. These theories draw mainly on the disciplines of sociology and psychology; in particular, social psychology.

2.5.1 The health belief model (HBM)

One of the earliest studies which examined the psychological factors associated with motorcycle riding was conducted in the UK in the late 1980s (Rutter & Quine, 1996; Rutter, Quine & Chesham, 1992, 1995). This study applied both the health belief model (see Janz & Becker, 1984) and the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980; Fishbein, 1980; Fishbein & Ajzen, 1975) in a postal survey examining the relationship between rider beliefs, characteristics, and self reported behaviour.

The health belief model (HBM) was developed in the 1950s as a response to concerns over people's unwillingness to take up disease prevention initiatives. Essentially it consists of 4 aspects:

- Perceived susceptibility: the extent to which someone feels that they are likely to contract the condition;
- Perceived severity: how severe the consequences would be if they did contract the condition;
- Perceived benefits: whether the individual feels that taking preventative action would indeed reduce the risk of contracting the condition; and
- Perceived barriers: the estimated negative effects of taking the health action (costs, discomfort, time, pain, difficulty etc.)

(Janz & Becker, 1984)

In the preliminary study by Rutter et al. (1992), 400 questionnaires were posted out to riders; 200 testing the HBM and 200 testing the TRA (see next section for a discussion on the TRA component of this study). The HBM did not show a significant relationship to crashes. In the main study, Rutter et al. (1995) sent out 2051 postal questionnaires to assess beliefs relating to behaviour and crashes using the HBM and 2050 questionnaires using the TRA.

A second questionnaire was posted 12 months later to examine the self reported behaviours, crashes, and other measures such as exposure that had occurred during that 12 month period. They found that the best predictor of crashes was the self reported behaviour of breaking laws and rules (i.e., speeding, breaking traffic laws, breaking the highway code, riding too close). Both the TRA and HBM explained similar amounts of variance (31%) for this behaviour. Once demographic factors such as age, sex, education, experience and training were accounted for, two significant predictive factors of law breaking behaviour (obeying laws and taking care) emerged from the TRA, whilst the HBM produced four factors. These were:

- feeling safe: people who stated that following the road rules and concentrating properly made them feel safe, and that showing consideration for other road users earnt them goodwill, and doing what was taught made them feel skilful, were less likely to report breaking laws and rules 12 months later;
- having fun: those who reported that breaking the speed limit is fun, that riding too close to the vehicle in front makes overtaking easier, that riding after drinking gave them increased confidence and who disagreed that bright or reflective clothing helps people to see you better, were more likely to report breaking laws and rules later;
- good bike performance and safety: those who agreed that maintaining their bike makes it perform better, and concentrating while riding makes them feel safer, and who disagreed that riding too close makes overtaking easier, and disagreed that wearing a crash helmet made them feel safe, were more likely to report breaking laws and rules at time two, 12 months later; and
- risk of crash: those who agreed that breaking the speed limit increases their risk of having a crash, and maintaining your bike takes time and expense, and who disagreed that wearing bright or reflective clothing makes you look stupid, or obeying the traffic laws slows you down were less likely to report breaking laws and rules 12 months later.

(Rutter et al., 1995)

The health belief model was also compared with the theory of planned behaviour (TPB) (an extension of the TRA) in a UK study of schoolboys (Quine, Rutter & Arnold, 1998) and a Finnish study of teenage bicycle helmet use (Lajunen & Räsänen, 2004). Both studies found the TPB to be a better predictor of helmet use than HBM (see section 2.5.3 for a discussion of the TPB). In the Finnish study, only barriers to helmet use and cues to action were significant predictors of helmet use from the HBM; however, subjective norm (from the TPB) was the strongest predictor (Lajunen & Räsänen, 2004). The HBM was also found to be less effective in predicting intentions to drink-drive than the TRA (Beck, 1981). However, this study has come under some criticism due to low response rates and the operationalisation of some of the key beliefs (see Janz & Becker, 1984).

Young adult pedestrian behaviour has also been examined using the HBM (Yagil, 2000). The benefits and barriers to crossing at ‘don’t walk’ signals were predictive of unsafe crossing behaviour, whereas vulnerability and seriousness were not found to be predictive. Normative influences were significant predictors only for males.

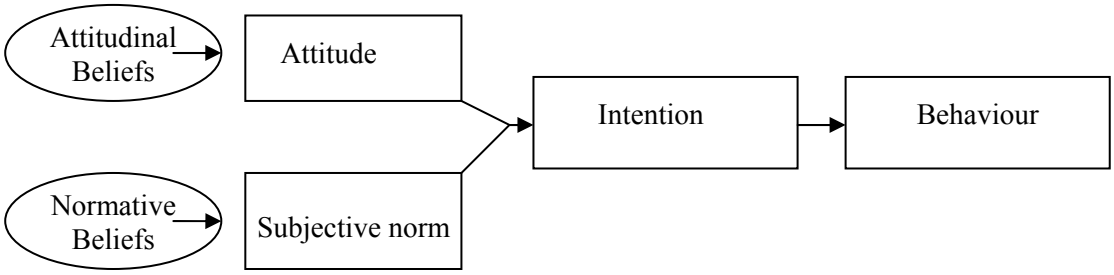
These studies indicate that the HBM can be successfully used to examine motorcyclist and other road user behaviour; although it appears that the HBM may not be quite as effective in predicting behaviour as the TRA or its extension, the TPB.

2.5.2 The theory of reasoned action (TRA)

The theory of reasoned action (TRA) (Ajzen & Fishbein, 1980; Fishbein, 1980; Fishbein & Ajzen, 1975) postulates that intentions are the best predictor of behaviour. Intentions are formulated via a reasoned process whereby the individual considers the consequences of their actions, either implicitly or explicitly. The behaviour reasoned to be the most likely to achieve the most positive outcome for the individual is then enacted.

The TRA hypothesises two determinants of intentions: attitudes and subjective norms (see Figure 4) which are underpinned by attitudinal and normative beliefs about the consequences of the behaviour. The strength of a person's attitude (i.e., their positive or negative evaluation of performing the behaviour) combined with the weight of social pressure they perceive they are under to perform the behaviour (subjective norm) will influence the strength of their intention to perform the behaviour and the subsequent action.

Figure 2. The theory of reasoned action



Source: Figure adapted from Fishbein and Ajzen (1975, p. 16 and p. 334)

In a preliminary study into motorcyclist behaviour, Rutter et al. (1992) used factor analysis on 200 postal surveys to test the TRA (in addition to the 200 surveys used to test the HBM, see section 2.5.1). They found self reported behaviour fell into three main categories: "law breaking", "carelessness", and "safety equipment and training". For these behaviours, personal (or attitudinal) beliefs accounted for a significant proportion of the variance whereas normative beliefs did not. However, when they explored crashes, they found that both attitudinal and normative beliefs about being considerate and law abiding were significantly (negatively) related to crashes.

As mentioned previously, in the main study, Rutter et al. (1995) found that the best predictor of crashes was the self reported behaviour of breaking laws. The TRA component showed beliefs that being a safe rider meant following the highway code, obeying traffic laws, not speeding, and doing as taught *negatively* predicted self reported law breaking behaviour at Time Two. However, a second significant factor, 'taking care', was contrary to expectations as the belief that being a safe rider (which meant concentrating properly, maintaining your bike, showing consideration, and following the highway code) emerged as a *positive* predictor of law breaking behaviour at Time Two. Rutter et al. (1995, p.380) suggest that this may be "*because a belief in taking care leads to overconfidence, risk compensation, or breaking the law to avert danger to oneself or others*".

Fishbein and Ajzen (Ajzen & Fishbein, 1980; Fishbein, 1980; 1975) found the TRA to work well for behaviours which were completely under an individual's volitional control. However, not all behaviour falls into this category. Internal factors such as skill, information, and ability may impact upon volitional control. For instance, if a person intends to perform "wheelies" on their motorcycle, and there is normative support for this action, a lack of skill may mean that an individual is unsuccessful in actually performing this behaviour.

External factors may also affect volitional control; for instance, rain or a flat tire may prevent a person riding on a given day despite their strength of intention or the normative influences for them to do so.

Rutter et al. (1992) noted that younger riders (who also had more crashes and less experience than older riders) believed that they had less control over whether or not they crashed compared with the beliefs of older riders. One explanation for this could be that inexperience reduces the amount of volitional control riders have over their machine and the environment.

Budd, North, and Spencer (1984) also used the TRA in a road safety capacity. They extended the TRA to include a measure of past behaviour to explore people's intentions to use their seat belts. The results of this study demonstrated that, whilst the TRA could be used to predict intentions to wear a seat belt, an additional 7-9% of the variance could be explained once a measure of past behaviour was incorporated. Similarly, Stasson and Fishbein (1990) and Trafimow and Fishbein (1994) also investigated seatbelt use. Both studies showed that the perceived risk of a situation could affect intentions to wear seatbelts. Stasson and Fishbein concluded that a riskier environment tended to increase perceived normative pressure to wear their seatbelts in participants whose intentions varied across contexts. Trafimow and Fishbein showed that attitudes had a greater influence on intentions to wear a seatbelt in a 'safe' driving environment, whereas normative influences were more influential in a 'risky' driving environment.

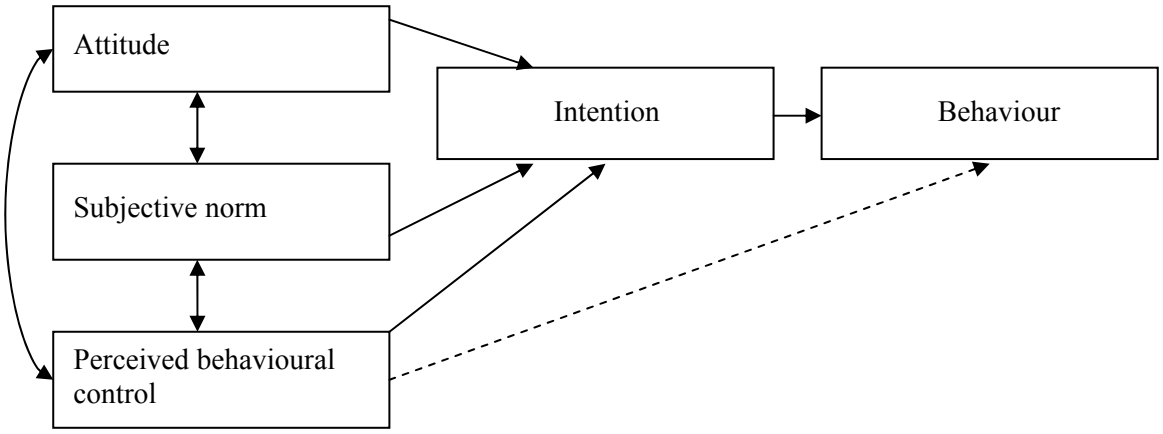
As described earlier in section 2.5.1, Beck (1981) found the TRA model more effective in predicting intentions to drink drive than the HBM. Attitudes proved to be a better predictor of intentions to drink drive than subjective norms by Beck (1981) and Carbonell Vaya et al. (1997). A study into driver speeding choices found that, whilst attitudes were influential on intentions to speed, normative influences as defined by the TRA were not. Instead, passengers, other road users, or police had a greater influence on speed choice than significant others such as family or friends (Haglund & Aberg, 2000).

2.5.3 The theory of planned behaviour (TPB)

The theory of planned behaviour (TPB) has been used as the basis of a number of road safety studies in an attempt to understand issues such as speeding and other traffic violations (Newnam, Watson & Murrary, 2004; Parker, Manstead & Stradling, 1995; Parker, Manstead, Stradling, Reason & Baxter, 1992; Parker, Stradling & Manstead, 1996), bicycle helmet use (Lajunen & Räsänen, 2004; Quine et al., 1998; Quine, Rutter & Arnold, 2001), pedestrian behaviour (Evans & Norman, 1998), transport modal choice (Bamberg, Ajzen & Schmidt, 2003; Forward, 2004), drink driving (Gordon & Hunt, 1998; Sheehan et al., 1996) and seatbelt use (Gordon & Hunt, 1998).

Ajzen (1985; 1988; 1991) formulated the TPB to take account of behaviours which are subject to factors over and above an individual's motivation to perform the behaviour; that is, factors which may be outside the volitional control of the individual (see Figure 5). Essentially, like the TRA, the TPB assumes that a person's salient beliefs underpin behaviour. With the TRA, beliefs influence the attitudes and subjective norms, which in turn are determinants of intention, which then leads to the resulting behaviour. The TPB introduces a third determinant, perceived behavioural control (PBC). PBC is also underpinned by beliefs and is included to take account of factors which are perceived to be not completely under an individual's control.

Figure 3. The theory of planned behaviour



Source: Figure adapted from Ajzen (1991, p. 182)

Ajzen (1991) argues that the predictive value of the determinants of intention and behaviour will vary across situations and individuals. For example, for some situations, attitudes may be a more important predictor than normative influences. In others, or for other individuals in the same situation, perceived behavioural control may be the best predictor. In short, the theory hypothesises that these three factors (attitude, subjective norm, and perceived behavioural control) influence the behaviour of most people, although the exact amount of influence exerted by any one of these factors varies according to the particular person and the particular situation. In most people, however, the strength of intention in conjunction with estimates of perceived behavioural control (PBC) will determine the behavioural outcome. Where a person has sufficient actual control over the behaviour in question, intentions alone will predict this behaviour.

The amount of variance in behaviour explained by the TPB differs across studies. Although differences in methodology or the operationalisation of variables may account for some of this variance, it is likely that the TPB may actually have greater predictive validity for some behaviours rather than others (Ajzen, 1991). Meta-analyses of the theory seem to indicate that TPB accounts for between 32% and 50% of the variance in behavioural intention and between 16% to 42% in actual behaviour (Armitage & Conner, 2001a; Godin & Kok, 1996; Sheeran & Orbell, 1999; Sutton, 1998). The efficacy of the TPB as a tool for changing behaviour is less clear. A review by Hardeman et al. (2002) of 24 published interventions using the TPB showed the design of these studies made any such conclusions difficult. Many of the reviewed studies appeared to use the TPB to measure process or outcome variables rather than as a tool for designing the intervention. As the review was dependent upon the information presented in the published papers, comparing relevant data across studies was not always possible. Despite this uncertainty, the authors suggested that the TPB may be of particular relevance in designing interventions where people are not firmly motivated to change their behaviour (Hardeman et al., 2002).

The TPB was used by Parker et al. (1992) to investigate driver's attitudes and intentions towards four specific traffic violation scenarios. Although age (youthfulness) and gender (males) were found to the strongest predictors of intention to commit similar violations, as Parker et al. argued, neither of these factors can be said to *cause* people to commit traffic violations. Therefore, they performed a hierarchical regression analysis to examine the effects of the TPB variables. The results are presented in Table 4.

Table 2. Variance explained by TPB in hierarchical regression on four traffic violation scenarios posed by Parker et al. (1992)

Theory of planned behaviour variables	% variance explained in intentions to:			
	drink and drive	**speed**	**follow too closely**	**overtake dangerously**
Attitude and subjective norm	21.3	32.8	20.0	24.2
Perceived behavioural control	20.9	14.5	3.4	7.5
Total variance explained by TPB variables	**42.3**	**47.2**	**23.4**	**31.7**

As Table 4 shows, the TPB explained over 40% of the variance in intentions towards drinking and driving and speeding, with the PBC item adding to the model significantly. For these two scenarios, PBC was the best predictor of the three variables. Analyses showed that, the more control a person considered they would have in these hypothetical scenarios, the less they were likely to engage in such behaviour. The other two scenarios, following too closely and overtaking dangerously were best predicted by subjective norm. However, in this study, subjective norm was measured using six referent groups (police, partner, other road users, immediate family, 'the typical young male driver', and friends), more similar to normative beliefs, rather than the traditional TPB style which uses a more general referent format such as 'people who are important to me'. After allowing for the TPB variables, age and gender only accounted for a small proportion of the remaining variance across the behaviours (between 1 and 4%).

For predicting the intentions of teenagers to use bicycle helmets, Lajunen and Räsänen (2004) found the subjective norm and 'instrumental' attitude (whether wearing helmets is beneficial, clever, or good) to be the best predictors of intentions. Quine et al. (1998) found the TPB to explain 43% of the variance compared with only 18% of the variance explained by the HBM. Subjective norm was the strongest predictor of intention to wear a helmet followed by PBC.

2.5.4 Extending the TPB: other sources of influence on behaviour

The TPB model allows for additional predictive constructs to be included in the model provided they can be argued as causal to intention or behaviour and independent of the theory's existing constructs (attitude, subjective norm, and PBC) (Ajzen, 1991). In an attempt to develop a better predictive model for a given behaviour, many recent studies have extended the TPB to incorporate other independent variables (see Conner & Armitage, 1998, for a review). This is, at least in part, due to the relative weakness of the subjective norm to predict intentions or behaviour found in many studies (Ajzen, 1991; Armitage & Conner, 2001a; Farley, Lehmann & Ryan, 1981; Johnston, White & Norman, 2004; Terry & Hogg, 1996; Terry, Hogg & White, 1999). The poor performance of subjective norm, according to Ajzen, shows the importance of "personal considerations" over "perceived social pressure" (Ajzen, 1991, p. 189). However, Terry and Hogg (1996) argue that social influences are important and have not been adequately captured by the traditional TPB operationalisation of this construct.

The weakness of the subjective norm may also be partially explained by findings which show that, for the majority of people, their attitudes are most likely to predict their intentions. Some people's intentions are influenced primarily by the social component of the model which is represented by the subjective norm (Trafimow & Finlay, 1996). Whilst this finding suggests that people are predisposed to being more attitudinally or normatively controlled, further studies have found that

specific behaviours may also be more usually attitudinally or normatively controlled, regardless of the individual's disposition, and that attitudinally controlled intentions are more likely to be carried out than normatively controlled intentions (Sheeran, Norman & Orbell, 1999; Trafimow & Finlay, 2001). These findings were supported by Johnston, White, and Norman (2004) who further speculated that strengthening the subjective norm with a social identity construct may improve the norms-intention relationship for all people, regardless of their attitudinal or normative disposition.

In the road safety context, Gordon and Hunt (1998) concluded that the subjective norm was the weakest predictor of intentions to speed in both urban and rural environments but suggested that this may be because the item they used asked about what important others thought, rather than accounting for potentially more relevant normative factors such as the speed of other drivers. Support for this conclusion has been found in other studies such as those conducted by Hagluan and Aberg (2000) and Parker, Manstead, Stradling and Reason (1992). Indeed, as mentioned earlier, some studies have attempted to strengthen the subjective norm component by nominating specific referent groups, in a manner representative of normative beliefs, rather than simply asking about the people who are important to them (e.g., Norman, Clark & Walker, 2005; Parker et al., 1992). Therefore, the introduction of a specific relevant referent group (such as 'the people I ride with') may provide a stronger model than the traditional TPB subjective norm (e.g., 'the people who are important to me').

In addition, the concept of 'identity' may prove a useful addition to the TPB, as demonstrated by Armitage and Conner (2001b) who found that the inclusion of self identity and moral norm components added significantly to the predictive validity of the TPB towards intentions to donate blood. The next section explores whether a more specific measure of the way people classify themselves within the context of riding might provide a better explanation of intentions and behaviour than the TPB alone.

2.5.4.1 Identity

The concept of identity is commonly understood to relate to the way people classify themselves relative to their social environment. Two schools of thought on identity, one more sociological (identity theory) and the other more psychological (social identity theory) in basis, have contributed to various TPB studies (Armitage & Conner, 1999, 2001b; Fekadu & Kraft, 2001; Sparks & Guthrie, 1998; Terry & Hogg, 1996; Terry et al., 1999). These theories have been used to form the basis of independent measures of identity in an effort to increase the amount of variance explained in predicting intentions and behaviour.

Researchers hypothesising that identity could be adequately operationalised within the existing attitude component of the TPB found evidence contrary to their expectations. Instead, they found identity had an independent effect on behavioural intentions over and above attitude (Sparks & Shepherd, 1992). Other researchers have argued that identity is a separate construct from the subjective norm (Armitage & Conner, 2001b; Terry & Hogg, 1996). The main point of difference lies in the specificity of identity theories; as noted previously, the TPB's subjective norm examines the extent to which important others (e.g., parents, friends, spouse) would approve or disapprove of an individual's behaviour in any given situation. Identity constructs examine the importance of specific people or groups of people, or one's own social role-related beliefs, which are the most salient in a specific situation.

This distinction is potentially important for research focusing on motorcyclists. Krige (1995b) found that, although only 12% of the Australian riders in her sample belonged to clubs, over half rode in groups with other motorcyclists. She also found that female riders were highly likely to have a riding partner. Both identity theory and social identity theory attempt to explain the concept of 'self' within a larger social environment; however, there are important differences between the perspectives.

Identity theory

Identity theory was first introduced by sociologist Sheldon Stryker (1968). It argues that people play a certain role within their social context. For instance, a man may hold the multiple roles of 'father', 'motorcyclist', and 'doctor'. These roles have meaning within an individual's social structure and carry certain assumptions of behaviour. A person, therefore, has multiple 'identities' which are the product of an interaction between the individual self and these socially understood roles.

Identity theory seeks to explain behaviour in terms of the interaction between an individual's role identities with others' role identities in their social structure. The identity that is accessed in any given social situation, according to Stryker (1968; 1987), is deemed the most 'salient'. Whether one role identity is more salient than another in a given situation is determined by the level of 'commitment' attached to that identity.

'Commitment' involves the individual weighing the cost to the relationship if they do not enact the expected identity role (Stryker, 1968, 1987). This process is a function of both the absolute number of relationships dependent on that identity, as well as the importance or depth of the relationships (Stryker, 1968). Using the previous example, deviating markedly from the man's identity role as 'doctor' in a hospital environment could result in loss of employment and/or social status. The large number of relationships affected (e.g., hospital staff, colleagues) combined with the role's high personal importance, is likely to result in a high commitment to this role in this situation. The 'doctor' role would, therefore, be the most salient and the most likely to be enacted. Conversely, if he is out riding with other motorcycle enthusiasts, the 'doctor' role may not be appropriate for that setting.

Social roles were one of the factors examined in a longitudinal study of 18-25 year old drivers by Jessor et al. (1997). Jessor et al. hypothesised a decrease in risky driving associated with movement into adult social roles related to changes in both self and social expectations. Whilst the operationalisation of roles was rather simplistic (social roles were defined simply by marital status, employment, and parenthood), changes in social role were significantly related to a decrease in risky driving in the women who were identified at time 1 as being high risk drivers. For high risk men, those who appeared to mature out of risky driving also reduced more general delinquent-type behaviour. As measures of conventionality proved a better fit for risky driving than social role, Jessor et al. concluded that risky driving was only one aspect of a larger pattern of deviant lifestyle. These findings supported earlier work by Beirness and Simpson (1990) who found young drivers involved in crashes often exhibited wider problem behaviours.

Similarly, Evans and Norman (1998) extended the TPB with an identity construct to investigate pedestrian decision making. They found that people who labelled themselves as "safe pedestrians" were indeed more likely to report safer intentions when presented with various road crossing scenarios. This additional variable added around 3% to the variance explained by the TPB in two of the three scenarios.

Identity theory may be useful in this current study as the act of riding a motorcycle undoubtedly contributes to a clear identity role for many riders. For some, the act of carrying a helmet and wearing a motorcycle jacket can establish a motorcycle-oriented identity within any social context (Schouten & McAlexander, 1995). Typically, other studies ask questions which gauge whether being the sort of person who does 'X' is an important part of their identity (e.g., Sparks & Shepherd, 1992). However, in this instance, it may be more fruitful to make a distinction between whether a person identifies as a safe or risky rider, rather than asking the more general question of whether being a motorcycle rider is an important part of their identity. This more specific phrasing may provide a better explanation of intentions towards safe and risky riding behaviours, and

provide additional information that serves to explain greater variance in intentions and behaviour, than the TPB alone.

Social identity theory

Social identity theory, like identity theory, explores identity as a social construct. First introduced in the late 1950s by social psychologist Henri Tajfel and later developed in conjunction with John Turner in the 1970s and 80s (Tajfel & Turner, 1986), social identity theory focuses on the similarities of in-group identity as compared to out-groups, whereas identity theory examines individual role identities as compared to counter-roles within a group as explained in section 0.

From a social identity theory perspective, a person constructs their identity in terms of accentuating similarities to the membership of social groups that provide them with a positive social identity and disassociating from the characteristics of relevant referent groups they do not belong to (e.g., management vs. staff; one football team vs. another) (Tajfel & Turner, 1986). An important point of difference from identity theory (which requires social interaction to create meaningful 'roles'), is that the group does not actually have to be present for a person to feel belonging. A shared understanding of what being a member of that group means is sufficient (Stets & Burke, 2000; Terry & Hogg, 1996).

Brown defines a group as *"two or more people possessing a common social identification and whose existence as a group is recognized by a third party*" (Brown, 1990, p. 17). Within the general motorcycle riding population, it would be expected that the notion of 'group' will vary amongst individuals. For some, the 'group' may consist of a structured motorcycle club; for others, it may refer to a group of friends they ride with. Others may only moderately identify with other motorcyclists in general, as distinct from car drivers. Research suggests that those who identify strongly with a referent group will be most susceptible to act in accordance with the perceived group norms, whereas those that do not feel a bond with the group are more likely to behave in accordance with their own personal attitudes and intentions (Terry & Hogg, 1996; Terry et al., 1999). The influence of group norms on behaviour was investigated by Johnson and White (2003) who found that group norms directly influenced binge drinking behaviour. Other studies have similarly explored the influence of what they term, the "descriptive norm". This term *"describes what is typical or normal. It is what most people do, and it motivates by providing evidence as to what will likely be effective and adaptive action: "If everyone is doing it, it must be a sensible thing to do."* (Cialdini, Reno & Kallgren, 1990, p. 1015) Descriptive norms have been found to influence littering behaviour (Cialdini et al., 1990), intentions to play the lottery (Sheeran & Orbell, 1999), intentions to use alcohol and tobacco (McMillan & Conner, 2003), and intentions to engage in sports related aggression (Norman et al., 2005). As motorcycle riding is often undertaken as a group activity, social identity theory could be usefully incorporated into a TPB model by examining how the perceived normative behaviour of the group influences behavioural intentions.

2.5.4.2 Personal Norm

One additional predictor explored by Fishbein (1967) and Ajzen (1991; Beck & Ajzen, 1991) is that of personal or moral norms. Personal norms were originally dropped from the TRA and TPB as they appeared to confound the understanding of behavioural intentions and were difficult to adequately operationalise (Fishbein & Ajzen, 1975). However, it has been argued that a measure of personal norm may be a useful addition to the TPB when examining deviant or socially undesirable behaviours (Parker et al., 1995). The personal norm, as defined in their study of traffic violations, "reflects an individual's internalized moral rules, while social (subjective) norm reflects the individual's perceptions about what others would want him/her to do" (p. 129). Personal norm was found to explain a significant proportion of variance in intentions to commit traffic violations (between 10% and 15%) after the standard TPB variables had been accounted for (Parker et al.,

1995). This percentage is much higher than Conner and Armitage's (1998) meta-analysis results, which indicated that moral norm added, on average, around 4% to the predictions of intention. It is possible that this difference is due to the fact that the Parker et al. study combined moral norm with anticipated regret into a single 'personal norm' construct, or it could be indicative of a stronger effect due to the illegality of the behaviours examined.

Gordon and Hunt (1998) found that the TPB explained 46% of the variance of intentions to speed on rural roads in New Zealand. This percentage increased to 58% when the personal norm component added. However, for intentions to speed on urban roads, 43% of the variance was explained by TPB but only an extra 1% was added by the personal norm. One possible explanation for this posed by the researchers is that drivers may feel they have less control over their speed choices in an urban environment, so PBC becomes the best predictor in this environment. The personal norm construct was also found to significantly improve the predictive power of the TPB model with regard to intentions to drink-drive and to wear seatbelts (Gordon & Hunt, 1998). Despite these conflicting findings within the literature, the fact that deliberate risk-taking on a motorcycle often includes committing traffic violations suggests that this construct could prove a useful extension to a TPB model.

2.5.5 Risk taking

The field of transport psychology has emerged as political imperatives to address the road toll have become more pressing. Consequently, much of the research in this field draws on crash statistics and targets 'preventable' causes of crashes (such as risk taking behaviours by road users) in order to find ways to reduce road carnage as quickly as possible. It is well established that risk taking behaviours (e.g., speeding, unlicensed riding) are related to motorcycle crashes (Federal Office of Road Safety, 1997; Haworth, Smith et al., 1997; Haworth et al., 2000; Preusser et al., 1995). The Jessor, Turbin, and Costa study (1997) into the risky driving behaviour of 18-25 year olds raised two important implications for research into road user risk taking. First, that wider lifestyle issues may have an important influence on the success of interventions and second, that a reduction in risky driving may be possible in even the most risky young drivers through changing social roles and behavioural conventions.

A recent Taiwanese study seems to support the first assertion made by Jessor et al. as Taiwanese adolescents who had crashed their motorcycles were found to be more likely to generally take risks in their lives than riders who didn't crash. Further, crashing did not seem to modify this general risk taking behaviour (Lin, Huang, Hwang, Wu & Yen, 2004).

The second point is more difficult to substantiate as most interventions are aimed at the general population rather than targeting particular 'high risk' individuals. Although Jessor et al. found evidence to suggest that most young people "mature out" of risk taking by either adopting more adult roles (e.g., marriage, employment) or by changing their behavioural norms (e.g., moving away from delinquent peer groups and become less tolerant of delinquent behaviours), Sheehan et. al (1996) found mixed results when they attempted an intervention to change the risk-taking behaviour of Year 10 high school students. A 3-year follow up of a drink driving education program showed that the behaviour of students who were experimenting with high risk behaviours could be successfully modified; however, the small proportion of students identified as engaging in very high-risk problem behaviours at the time of the intervention were not influenced. Sheehan et al. concluded a tailored intervention may be required for this sub-group. Both of these studies focused on young people, and provide encouraging results; however, the number of older motorcyclists killed or injured suggests that high risk motorcycle riding is not restricted to the young.

Two popular psychological explanations used in road safety to explain risk taking behaviour are examined in the next two sections. First, Wilde's (1994) risk homeostasis theory is explored. This theory purports that a certain level of risk is a natural and accepted way of life. Wilde suggests that people tolerate an accepted level of risk. Therefore, interventions which reduce risk will not ultimately save lives unless people can be motivated to lower their accepted level of risk. Second, a discussion of sensation seeking (Zuckerman, 1979b, 1994; Zuckerman, Kolin, Price & Zoob, 1964) is presented in Section 2.5.5.1. According to Zuckerman, sensation seeking is a biologically determined trait, predisposing people to greater risk taking than the rest of the population.

2.5.5.1 Risk Homeostasis

Wilde's Risk Homeostasis Theory (Wilde, 1982, 1988, 1994) was originally developed to explain road user behaviour and traffic crash statistics. It proposes that people have a certain 'target level of risk' which they are comfortable with at certain times of their lives and which may vary with given situations or activities (for example, riding a motorcycle). If the 'perceived level of risk' becomes much lower than the 'target level of risk', people are prepared to engage in extra risk if this is advantageous to them. If the perceived level of risk is too high, they will adjust their behaviour to lessen their risk.

Wilde (1994) suggests a person's perceived level of risk is determined by their past experience, their assessment of the accident potential of the situation, and the degree of confidence they have with their own decision making and vehicle handling skills. The 'target level of risk' is then usually derived by a subconscious weighing of the advantages and disadvantages of the behaviour, although this can also be a conscious process.

This theory would suggest that many riders do not want zero risk, they are willing to accept a certain amount of risk in order to receive a perceived benefit (e.g., the 'thrill', 'adrenaline rush' or simply to relieve boredom). These riders are unlikely to change their behaviour unless they are sufficiently motivated to reduce the level of risk. This motivation can be achieved either by reducing the perceived benefits of taking the risk or by increasing the perceived advantages of engaging in less risky behaviours.

The concept of risk homeostasis has been the subject of much academic debate (Adams & Hillman, 2001; O'Neill & Williams, 1998; Thompson, Thompson & Rivara, 2001; Wilde, Robertson & Pless, 2002), as the theory purports that well-meaning safety interventions (such as mandatory seat belt use or helmet wearing) may result in the driver or rider feeling safer and, therefore, taking more risks to compensate. This results in fairly static crash involvement rates unless the drivers or riders are sufficiently motivated to lower their 'target level of risk'.

The introduction of mandatory helmet use in the USA has given rise to studies that show the number of motorcycle-related deaths decreased as a result of this initiative (Auman, Kufera, Ballesteros, Smialek & Dischinger, 2002; Kraus, Peek, McArthur & Williams, 1994; Watson, Zador & Wilks, 1980), as well as studies that show it only lowered the number of deaths due to head-injury, rather than the total number of motorcyclist fatalities *per se* (Sosin & Sacks, 1992). The latter finding is consistent with risk homeostasis theory as the number of deaths not related to head injuries would have had to have increased to maintain a stable number of fatalities; suggesting that riders were taking more risks on the road in response to the requirement to wear a helmet.

A natural research opportunity on this topic presented itself within the USA as many States repealed or weakened their mandatory helmet laws as a result of public pressure and the cessation of federal funding penalties to States that did not comply. In Arkansas, the repeal of helmet laws had the following results: motorcycle fatalities from non-helmeted riders rose from 47% to 78% and the number of motorcycle registrations almost doubled (suggesting that some motorcyclists either gave up motorcycling rather than wear helmets and then returned to riding once the laws were repealed,

or the repeal of laws attracted new riders) (Bledsoe, Guohua & Van Rooyen, 2004). Kraus, Peck and Williams (1995) theorise that it was the riskier riders who were more likely to have stopped riding in response to laws mandating helmet use as it is likely this group of riders did not wear helmets before the law's introduction. They examined Californian data (where helmet use was not mandatory) and found crashed riders not wearing a helmet were more likely to be young, unlicensed, and under the influence of alcohol than helmeted crashed riders. Although the repeal of the mandatory helmet law in Arkansas may have contributed to an influx of new or returning riders, potentially with higher 'target levels of risk', the percentage of alcohol related motorcycling fatalities remained fairly constant at around 38%. The consistency of this figure suggests that any new or returning riders did not differ significantly from the pre-repeal motorcycling population with regard to drinking and riding.

Nevertheless, a distinct shift in who was dying in alcohol related motorcycle crashes occurred. Before the repeal, helmeted riders with a positive BAC made up 40% of fatalities, after the repeal it dropped to 18.5%, whereas 35.5% of non-helmeted riders before the repeal had a positive BAC result compared with 49.3% afterwards (Bledsoe et al., 2004). This finding indicates that the riders who chose not to wear helmets were also more likely to take additional risks such as drinking and riding. According to risk homeostasis theory, not wearing a helmet should have made riders take greater precautions with their safety, not increase their risk by drinking. If anything, this result may indicate support for Zuckerman's (1979b; 1994) sensation seeking type personality.

2.5.5.2 Sensation seeking

First developed in the early 1960s, Zuckerman's Sensation Seeking Scale (SSS) (Zuckerman, 1979b, 1994; Zuckerman et al., 1964) has been widely used as a measurement tool relating to risky behaviours such as smoking (Zuckerman, Ball & Black, 1990; Zuckerman & Neeb, 1980), drinking (Zuckerman, 1987), risky sexual practices (Horvath & Zuckerman, 1993), and various forms of dangerous driving (Arnett, Offer & Fine, 1997; Jonah & Dawson, 1988; McMillen, Pang, Wells-Parker & Anderson, 1992; Whissell & Bigelow, 2003; Zuckerman & Neeb, 1980). Over the years, Zuckerman has refined the SSS and also updated the definition of sensation seeking. He defines it as:

> *'a trait defined by the seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experiences'* (Zuckerman, 1994, p. 27).

Zuckerman states that risk taking behaviour correlates with sensation seeking as high sensation seekers either underestimate or accept risks as the price of the sensation or experience. Few, however, seek to maximise their risk for its own sake. People who have a low SSS score tend to evaluate situations as more risky than their high SSS counterparts and further, do not see the point in taking the risk (Zuckerman, 1994).

In the studies relating to driving behaviour, a high sensation seeking score has been found to be associated with behaviours such as drinking and driving (Arnett, 1990; McMillen et al., 1992; Rolison & Scherman, 2003; Stacy, Newcomb & Bentler, 1991), reckless driving (McMillen, Smith & Wells-Parker, 1989), speeding (Arnett et al., 1997; Clement & Jonah, 1984; Lajunen & Summala, 1997; Palamara & Stevenson, 2003; Tay, Champness & Watson, 2003; Zuckerman & Neeb, 1980), and traffic violations (Furnham & Saipe, 1993).

A review of 38 studies exploring the relationship between sensation seeking and risky driving reported only 4 studies that did not establish a positive relationship (Jonah, 1997a, 1997b). Jonah asserts that sensation seeking appears to account for between 10 – 15% of the variance in risky driving, although the relationship is weaker in women than in men. In general, men score higher than women in sensation seeking with both sexes tending to have scores which peak around their

late teens or twenties and then decrease over time (Eby & Molnar, 1998; Zuckerman, 1994; Zuckerman & Neeb, 1980). This pattern would be consistent with the findings of Jessor et al. (1997) purporting that people tend to "mature out" of risk taking.

However, the results of studies which examine the relationship between sensation seeking and crash involvement are less consistent. Hartman and Rawson (1992) and Beirness and Simpson (1990) both found a positive relationship, whereas Wieczorek's (1995) study obtained the opposite result as participants who scored highly on the thrill and adventure scale were found to have had fewer crashes. Furnham and Saipe (1993), using the thrill and adventure and boredom susceptibly subscales of the SSS, found no direct relationship between sensation seeking and crash involvement; although there was some evidence of an indirect (negative) one. Furnham and Saipe determined that high sensation seekers were more likely to have been convicted of traffic offences (e.g., speeding, red light running, reckless driving); and further, that people with more traffic convictions had fewer crashes. Furnham and Saipe suggest that these high sensation seeking drivers may actually concentrate harder on their driving so have fewer crashes. This assertion is supported by the findings of Ball and Zuckerman (1992) and Martin (1986) whose results suggest that high sensations seekers can maintain their focus in the face of other distractions better than low sensation seekers.

In contrast, studies of young people seem to indicate that a high sensation seeking score is associated with a general willingness to engage in many forms of risky behaviours including dangerous driving which, in turn, leads to crashes (Beirness & Simpson, 1990; Hartman & Rawson, 1992). Young people are also subject to greater peer influence which may encourage risky behaviour (Hartman & Rawson, 1992; Horvath & Zuckerman, 1993; Jessor et al., 1997; Rolison & Scherman, 2003) and have less practical experience to know when they are driving beyond their capacity. Both Horvath and Zuckerman (1993) and Rolison and Scherman (2003) found risky behaviour was better predicted by perceived peer behaviour than a high sensation seeking score. Therefore, a study design which includes a specific subjective norm which relates to the people a person rides with, along with information on the normative behaviour of those people, would provide data which can be compared with sensation seeking scores to provide further insight into whether social factors or person-related factors have a stronger influence on risk taking intentions.

Zuckerman (1979b) states that sensation seeking and risk taking are highly correlated, and speculates that people who ride motorcycles are more likely to be high sensation seekers than non-riders. With regard to reckless driving practices, Zuckerman (1994) suggests that sensation seeking alone is not a strong predictor of crash involvement; instead, this biological trait in combination with other factors, such as hostile aggression, may be more predictive. A link between aggression and crashes was found by Wieczorek (1995) within a sample of convicted drink-drivers. Similarly, Matthews, Dorn, and Glendon (1991) found that high driver aggression was associated with minor crash involvement, but not major crashes. They suggest that it is possible that drivers high in aggression may be impatient enough to risk a minor incident, but not a major crash. Furnham and Saipe (1993) found no significant relationship between aggression and either crashes or convictions.

Given these varied findings, a measure of sensation seeking, and a measure of aggression, would be potentially useful constructs to include in a model to predict risky riding intentions. Assuming that motorcycling is likely to attract a larger proportion of high sensation seekers than what would normally be found in the general population in itself, high sensation seeking *per se* may not be a good predictor of risk taking behaviour in this population. It is possible that high sensation seeking, combined with high aggression (Zuckerman, 1994), may better predict high risk riding than either of these constructs independently.

Zuckerman's Sensation Seeking Scale (1979b; 1994), has been used in many studies and has been shown to be reliable; however, it may lack face validity within a road safety questionnaire. Feedback from Queensland motorcyclists indicted that statements such as "I often wish I could be a mountain climber" or "I would like to sail a long distance in a small but seaworthy sailing craft" (from Zuckerman's thrill and adventure seeking scale) seemed irrelevant within a questionnaire about motorcycle safety issues (Watson et al., 2003). A scale used by Stradling, Meadows and Beatty (2004), the thrill-seeking dimension of The Driver Stress Inventory (DSI) (Matthews, Desmond, Joyner, Carcary & Gilliland, 1997), may provide a useful alternative. The DSI comprises 5 dimensions of driver stress: aggression, dislike of driving, hazard monitoring, thrill-seeking and fatigue. Thrill seeking and aggression were found to be correlated ($r=.40$) and both were related to risk taking behaviour, which is similar to the findings of Zuckerman (1994). Although this 8-item thrill seeking scale has not been validated against the sensation seeking scale, previous research found that people who had crashed their cars scored significantly higher on this scale than those who did not (Stradling et al., 2004). The items relate to road user behaviour and hence have better face validity and could be adapted to a motorcycle study relatively easily. Therefore, this measure of thrill seeking, along with an indicator of on-road aggression, may be usefully incorporated into the current study in order to test both the direct, and interactive, effects of these variables on intentions.

2.6 Summary

This chapter has examined the main factors relating to motorcycle crashes. It has presented empirical evidence of these factors, providing clear evidence that the vast majority of motorcycle crashes are the result of human error.

Whilst external factors, such as other vehicles and poor road surfaces, are acknowledged as serious problems that require separate attention and intervention, the fact remains that a more defensive and attentive riding style could reduce the frequency and seriousness of these types of crashes (Association of European Motorcycle Manufacturers, 2004; Haworth, Smith et al., 1997; Sexton et al., 2004).

An exploration of theoretical perspectives, commonly used in road safety, was conducted to determine the most suitable on which to base this study of risk taking behaviour on motorcycles. Each of the theoretical perspectives examined has something to offer motorcycling safety; however, Ajzen's Theory of Planned Behaviour (TPB) (Ajzen, 1985, 1988, 1991) has been chosen as the basis for the this study as it seems to show the most promise in terms of providing a foundation for explaining and predicting risky riding. In a road safety context, the TRA and TPB have been shown to be more effective than the health belief model (HBM) in several comparative studies (Beck, 1981; Lajunen & Räsänen, 2004; Quine et al., 1998).

In response to some of the criticisms of TPB, in particular the weakness of the subjective norm in various studies of road user behaviour, additional constructs to measure social influence will need to be added to the model, including a specific subjective norm referent group (the people I ride with), identity, group norm and personal norm. These constructs are predicted to be of particular relevance due to the impact of motorcycle riding on one's own sense of identity and the high incidence of group riding.

Based in human physiology, sensation seeking (Zuckerman, 1979b) appears to have greater validation within the road safety context than risk homeostasis theory (Wilde, 1982). If a person is biologically "wired" to be a high sensation seeker, it would not be surprising if they found motorcycle riding appealing. Whilst high sensation seeking does have a relationship with risky driving or riding (particularly among young adults), the evidence suggests that sensation seeking, in itself, may not be enough to predict crash involvement (e.g., Jonah, 1997a). Indeed, some studies

have show that it may be possible that medium to high levels of sensation seeking could be a protective factor as these riders may actually be able to maintain better focus and concentration on the road (Ball & Zuckerman, 1992; Furnham & Saipe, 1993; Martin, 1986). Other personal factors, such as hostile aggression, or social factors, such as peer influence, may play a much more important role in predicting crashes (Hartman & Rawson, 1992; Horvath & Zuckerman, 1993; Rolison & Scherman, 2003; Wieczorek, 1995; Zuckerman, 1994). As shown in the literature review, very little information is available on the influence of group riding on crashes and rider behaviour. This study will provide a preliminary investigation into the influence of the riding peer group, as defined by a specific subjective norm referent group. The study will also examine whether past on-road aggressive behaviour either independently, or as an interactive effect with sensation seeking, predicts riskier riding intentions.

2.6.1 Research Questions

The examination of the literature provided an overview of motorcycling within Australia, revealing the population of motorcycle riders is both increasing and broadening. Australian motorcyclists now encompass a wide range of age groups, more females, and people of varying socio-economic status. Consequently, there is a greater need to develop a framework for understanding the road safety issues applicable to motorcyclists within an Australian context.

An examination of the characteristics of motorcycle crashes, both in Australia and overseas, highlighted a variety of psychosocial factors which appear to contribute to crashes. Whilst there are other important reasons for motorcycle crashes, such as the actions of other traffic, and road surfacing and maintenance issues, these issues are likely to require changes in local and state government policy to ever be adequately addressed. Therefore, collective lobbying may be the most effective action for motorcyclists to take on these kinds of issues. Conversely, psychosocial factors relating to crashes are often within the power of the individual rider to change. This program of research is aimed at exploring factors which have a greater potential for being addressed through interventions aimed at individual riders and to determine a means for identifying riders that may be at a higher risk of crashing for targeted early intervention. Based on this review, three key research questions emerge requiring further attention:

1. What behaviours do riders identify as being directly related to safe and risky riding?

The rationale behind this research question is to use an exploratory, qualitative, approach to determine what riders consider safe and unsafe. This information will augment the information provided by the literature review. Whilst crash statistics and reports provide important information, they rarely tell the whole story and may be biased by reporting protocols and missing or erroneous data. It is, therefore, important to gain a deeper understanding of how riders actually understand the concept of 'safe' versus 'unsafe or risky' riding; and of the range of behaviours and influences which riders identify as contributing to 'safe' and 'risky' riding. To gain this understanding, motorcyclists, along with people closely involved with motorcycling safety (such as the police and rider trainers), need to be engaged in the research process. A basic framework for these discussions can be developed based on the theoretical constructs identified in the literature review as being potentially most useful to explore motorcycle safety. Using theory in this way will ensure that a sufficient range of information is explored to facilitate further quantitative research.

2. What are the psychosocial factors that influence rider intentions and behaviour?

According to Ajzen (1985; 1988; 1991), intentions are a good predictor of actual behaviour. Therefore, in order to better understand the influence of psychosocial factors on rider safety, it is important to examine the factors that influence both rider intentions and behaviour. A better understanding of these psychosocial influences could inform the development of innovative rider training interventions, which address the underlying psychological and social aspects of rider

behaviour, as well as the physical and cognitive skills necessary for riding a motorcycle. It may also serve to encourage riders to make positive changes to their riding style by raising awareness about how these factors may influence their decision-making processes.

3. What is the impact of other riders on intentions and behaviour in a group riding situation?

The impact of other riders on motorcyclists' safety has not been well addressed in the literature. As motorcycle riding is often undertaken as a social activity, the people a person rides with may have a significant influence on their safety and/or risk taking intentions. Answering this research question may have important implications for rider training and education as the role of 'the group' may need to be factored into future initiatives.

3 A QUALITATIVE EXPLORATION OF RIDER OPINIONS AND BEHAVIOURS RELATING TO SAFE AND RISKY RIDING

3.1 Rationale for a qualitative study

The literature review identified a range of specific behaviours that are associated with motorcycle crashes, as well as some of the broad psychological and social factors that appear to contribute to these behaviours. In addition, the review of relevant theoretical perspectives provided a framework for examining the role of different psychosocial influences on rider behaviour. However, the review of the literature provided limited insight into the specific views and opinions of motorcycle riders, particularly in relation to the concepts of 'safety' and 'riskiness'. This is a critical gap in the literature, since it is possible that certain 'risky' behaviours identified in the literature may not be seen as inherently 'unsafe' by some riders. This may have important implications for understanding the influences on their behaviour.

To address this issue, this chapter describes a qualitative study undertaken to elicit the opinions and views of active motorcycle riders about their behaviour and the factors influencing it. A focus group process was selected to provide a means of gathering the necessary in depth information from a variety of relevant groups. In addition, this study was designed to illicit information about specific riding behaviours, considered to be safe or unsafe, to inform the design of Study 2. (A trilateral approach was used in Study 2 to identify relevant behaviours for examination, drawing on: (i) the available crash evidence; (ii) prior studies examining psychosocial influences on riding; and (iii) this focus group study.)

The specific issues addressed in this study are discussed below under the relevant research questions.

1. What behaviours do riders identify as being directly related to safe and risky riding?

Riders were asked about behaviours that they considered 'risky', and whether it was possible to distinguish a 'safe' rider from a 'risky' one. Using the TPB and other relevant constructs, a framework was developed to explore the concept of 'safe' from 'unsafe' or 'risky' in different ways.

2. What are the psychosocial factors that influence rider intentions and behaviour?

Because a theoretical approach was taken to the development of this study, it was possible to investigate a range of psychosocial influences on rider intentions and behaviour. This study utilised a set of structured questions to obtain in-depth information on attitudes, subjective norm, PBC, specific subjective norm, group norm, group identity, personal norm and crash attribution. A thematic analysis of all responses, based on the above constructs, was conducted to determine important psychosocial influences on intentions and behaviour.

In addition, while the literature review provided a list of the more common causes of crashes, it is important to gain a better understanding of the contexts in which these crashes occur. Consequently, to provide a more in-depth perspective on crashes, participants were asked about their on-road riding experiences and what factors had led to any past crashes or near misses they had experienced. Participants were also asked to discuss traffic laws and policing. In particular, riders were asked whether they felt policing affected their safety.

3. What is the impact of other riders on intentions and behaviour in a group riding situation?

For many, riding a motorcycle is a social activity (Krige, 1995b); however, little research has been done into whether riding within a social environment influences crash involvement. Several studies involving young car drivers indicate that peer group pressure, or competitive environments could relate to risky taking behaviours (Delhomme & Meyer, 1997; Horvath & Zuckerman, 1993; Rolison & Scherman, 2003; Summala, 1987). However, it is also possible that group riding could be a protective factor if the group a person rides with models 'safe' riding behaviours. An open discourse with riders helped to elicit information on the dynamics of group riding.

3.2 Method

3.2.1 Research structure

The qualitative study consisted of three phases. First, an initial pilot test of the focus group process was conducted with Queensland University of Technology (QUT) staff and students who rode or had ridden motorcycles and one staff member who had never ridden but had specialised research expertise in the area. This pilot test consisted of a one-on-one structured interview with one rider and one trial focus group of seven staff and students using questions and prompts related to the theory of planned behaviour, identity, and personal norm constructs. The concept of 'anticipated regret', suggested as a component of the personal norm construct by Parker et al. (1995), did not work well with either the test group or the interviewee. Participants reported that questions about whether they have ever felt sorry about any of their riding behaviour or have ever regretted the way they ride both confusing and irritating; although one participant said he regretted stopping for the police as they would never have caught him otherwise. Accordingly, it was decided not to explore anticipated regret further in this study. Instead, a causal attribution question (see Table 5, pg. 46) was asked as this seemed less antagonistic and a more concrete concept for riders to address. The participants appeared more comfortable recounting their experiences and attributing blame to themselves or others as opposed to a notion of regret. Although this preliminary testing process showed that the concept of 'moral norm' was also difficult for riders to discuss, it was not seen as antagonistic so it was retained.

The second phase of the qualitative research process involved conducting eight focus groups and one structured interview to elicit rider opinions on on-road safety and risk taking. It is this process which is described in full throughout the remainder of this chapter.

Third, although recruitment of the focus groups was designed to try to ensure that a good cross-section of riders was represented, a further 10 individual interviews were conducted as a confirmatory mechanism to ensure the data collected from the focus groups was consistent across a range of riders and that concept saturation had been achieved. These 10 additional participants (2 females and 8 males, aged from approximately mid-20s to late 60s) represented a wide range of rider types, encompassing those who reported engaging in extremely high risk riding activities through to those who reported being extremely safety conscious. Recruitment of these people was from the internet, rider clubs, and popular rider rest spots. These interviews were informal and not recorded. Out of consideration for the participants' time, each interviewee was only asked two or three of the full set of structured questions. Once they had responded, the researcher assessed whether they had raised all the issues mentioned by the focus groups to these same questions. If not, the researcher summarised the additional issues and asked the interviewee for comment. The researcher also assessed whether any new information had emerged from the discussion. The purpose of this process was to gauge whether the information from the focus groups was suitably

comprehensive and representative (i.e., to check whether any new information or issues were raised from these sources).

As no new information was gathered from these 10 informal interviews, the focus groups and two structured interviews were deemed to have provided an adequate cross-section of riders' views. Therefore, the remainder of this chapter presents only the results of the main focus group process, described as the second phase above.

3.2.2 Participants

A total of 43 people participated in this phase. Eight focus groups were conducted consisting of police, rider trainers (two groups), a non-government organisation representing motorcyclists' interests, club riders, non-club riders, young riders, and older riders. At least one female was present in 6 of the 8 groups. Participants included 34 males and 8 females aged approximately from 18 years to 65 years; however, most of the participants were older as only two groups included riders aged less than 25 years. All participants rode motorcycles, except for two police officers who patrolled, by car, a popular biking mountain range outside of Brisbane.

In addition to the focus groups, one individual interview was conducted with a male following the same structured questions as those utilised in the focus groups. This interview was conducted early in the process to assess whether there was a need for the focus group study to be augmented by individual interviews. Both the interviewee and the focus group participants were found to be equally forthcoming in their responses, perhaps because the questions were not of a highly personal nature. In fact, the focus groups appeared a richer source of information than the interview as the discussion and debate which occurred within the groups often prompted participants to re-examine the topic from a variety of perspectives. Therefore, while this single interview was included within the results of the focus group study; as previously described in section 3.2.1, it was decided that further informal individual interviews would only be conducted to confirm concept saturation.

3.2.3 Materials

The focus group discussions were structured around the TPB, identity, moral norm, and causal attribution constructs as shown in Table 5.

Table 3. Questions used to guide focus group discussions

Attitude
(also behaviour) What is a safe rider? What is an unsafe rider?
What are the advantages/disadvantages of riding safely/unsafely?
(also PBC) How do the road rules and police affect your safety?
Subjective Norm
Who do you discuss your riding with? Do you ever discuss safety issues?
Are there any people/groups which may affect the way you ride?
How do other important people in your life influence your riding behaviour?
Perceived Behavioural Control
How easy is it to always ride safely?

(also subjective norm, group norm) Have you ever felt pressured to ride in a way you'd prefer not to? What led to this?
Have you ever pushed your limits? Why?
What do you think affects the way you ride?
Group Identity
Is there a sense of being part of a group when you ride?
Self Identity
Do you feel differently about yourself when you ride your bike?
Moral Norm
Is there anything you see other riders' do which you think is just "the wrong thing to do"?
Causal Attribution
Can you tell us about times you almost lost it? Why did it happen? Could you have done something differently to prevent it? Was it bad luck, your fault or someone else's?

3.2.4 Procedure

Discussions with eight focus groups and one individual were conducted using the set of questions shown in Table 5. The recruitment and administration procedures used in this study were approved by QUT's University Human Research Ethics Committee (Ref No 3444H). Participants were recruited by sending emails and follow-up telephone calls to rider trainers, rider clubs and a non-government organisation; word of mouth; and via official police administrative channels (to access officers assigned to police motorcycles and those who patrolled stretches of road popular with motorcyclists).

The focus groups were facilitated by the author and another researcher, both motorcyclists, who noted the gender and estimated age of each participant. All participants signed consent forms obtaining their agreement to take part in the research and assuring them of individual confidentiality. The consent forms also gathered permission to record the sessions. These recordings aided subsequent analysis. The researchers stressed that they were interested in hearing a whole range of views on how riders manage their safety and that consensus was not required. Everyone was encouraged to express their views even if other members of the group disagreed.

3.2.5 Data analysis

Conceptual content analysis was used to analyse the information provided by the participants of the study. Using the focus group questions as a basis (see Table 5), themes that were raised in each discussion were identified and grouped under that question. Additional themes that did not strictly 'fit' within the framework were also examined but are not presented here as they are not directly relevant to the current study. These additional themes related to issues such as licensing, training, roads, and government policies which affect motorcyclists. Once all themes had been identified, the information was synthesised to address the three major research questions identified earlier.

To protect the anonymity of the participants, quotes are reproduced in this document without identifiable information (only gender and a group number are reported). The groups have been designated a random number to further protect the anonymity of the participants.

3.3 Results

Responses to each of the questions (see Table 5) are presented below. Overall, the results show some remarkable similarities across groups on some issues. In particular, there was marked consensus on what is a safe rider; although how this concept was operationalised by riders differed.

3.3.1 What is a safe rider?

Without exception, there was agreement by all participants that a safe rider was aware, focussed, and stayed within their limits. However, asking riders to define awareness, focus, or how one tells what their 'limits' are, produced a wide variety of responses, suggesting that whilst most riders consider these concepts critical to their safety, their conceptualisation varies between individuals.

The concept of 'awareness' almost always encompassed an awareness of other traffic.

> *"You've got to keep enough distance in front so you can read the conditions. Don't get in people's blind spots. Keep watching behind you, those are the ones who are going to crush you between two cars. Keep watching side streets, those are the ones who are going to pull out in front of you*." Male, Group 6.

Most groups mentioned 'defensive riding' with some stating that to stay safe, it was necessary to ride defensively at all times. Others disagreed, stating it was important that riders ride assertively at all times and take control of the road.

> *"You need to be aggressive, hesitation can cause a crash. You need to show the traffic you are going to go when you have the right of way – don't hesitate. But you need to make eye contact with the driver before you go."* Male, Group 2.

Several groups mentioned their frustration with traffic when they try to ride safely.

> *"A safe rider does not follow too close. Leave yourself enough room so if something happens you can manoeuvre. However, often if you leave yourself enough room, some clown jumps in front of you."* Male, Group 2.

Most groups mentioned general traffic scanning skills as essential to safety, a few mentioned reading the traffic in a pre-emptive manner, and some identified important attitudinal processes such as a rider's willingness to adapt their riding style to allow for traffic or their own limitations (e.g., being tired).

> *"You've gotta have the ability to recognise the potential for problems before it becomes a problem."* Male, Group 3.

> *"A safe rider has the ability to pre-empt what might happen. Thinks outside their immediate environment. Thinks about what they're doing."* Male, Group 1.

> *"You have to be willing to change with the conditions or the environment or your level of riding skill at that particular time."* Female, Group 5. [suggesting that these levels can change daily].

Several groups also mentioned the necessity of maintaining an awareness of other people you are riding with.

> *"We ride in a staggered formation to provide room to move."* Male, Group 2.

Other external factors such as the weather, the motorcycle itself (good maintenance and choosing the correct motorcycle for your experience and physical capabilities), and potential hazards such as pedestrians, were mentioned by some groups. Others extended 'awareness' to include an internal awareness of the self (although this was not common) and this concept appeared to vary from having an awareness of your mood, and physical well-being, to an awareness of your limits and skill, to an internal awareness and evaluation of how much risk is 'worth it'.

> *"All riding is risky, you just need to judge how much risk you take. Ask "do I need to do this?" I know I can safely fit in a gap with a car length and it might be safe for me to do this, but I won't because I don't need to."* Male, Group 7.

The concept of 'focus' appeared to generally mean maintaining concentration and being alert and responsive to any changes in the riding environment. Whilst there was unanimous agreement that 'focus' was essential to safe riding, ideas on how this could be achieved varied. Several respondents said that they achieved good focus by pushing their limits or riding at high speeds. They argued that, as they 'know' there is no room for error when engaged in these activities, their level of focus, concentration, and awareness is heightened, making them safer riders. When asked how easy it was to be a safe rider (see section 3.3.8) many riders reported that maintaining focus for an extended period of time was difficult.

Staying within one's limits was mentioned by every group and the interviewee as being necessary to be a safe rider. This concept seemed to consist of knowing your own bike handling skill (which may vary with mood, fatigue etc.) in combination with knowing the way the motorcycle you are riding handles.

> *"Someone who knows the limits of their machine and their own limits and who does not push the envelope or explore their limits too much in an uncontrolled environment like a road."* Male, Group 8.

Some groups mentioned explicitly that a safe rider would not be influenced by others to push beyond their limits. This issue of people (in particular young, inexperienced, males) riding beyond their capabilities in order to keep up with others, and subsequently crashing, was mentioned by every group and the interviewee. Interestingly, many participants commented that they needed to 'push their limits' to improve as a rider. So whilst everyone agreed that to be safe one should stay within their limits, many reported that to become more skilful (and 'safer') it was necessary to push these limits (for some, even to the point of coming off their motorcycle). When this apparent contradiction was explored further in the discussions, it emerged that many riders feel there is a 'safe' way of pushing their limits, and an 'unsafe' way. The difference appears to lie in whether it is a conscious, calculated risk, or something which is done as a result of feeling pressured to do something you aren't ready for. The end result, (crashing or not crashing) appeared to be of less importance. For some riders, taking a calculated risk to extend their abilities is a 'safe' way of pushing their limits, even if this results in them coming off the motorcycle.

> *"You get to know your limits by having crashes or near misses, when you lose control. It is trial and error, practice. You can't extend the limits of your riding without riding at your limits."* Male Interviewee.

Another common theme was the importance of maintaining good traffic skills such as positioning yourself correctly on the road, not being in another vehicle's blind spot, shoulder checking before changing lanes, and looking ahead in the traffic to anticipate potential hazards.

There seemed to be consensus that a basic skill set for handling the motorcycle was necessary to be a safe rider, as concentrating on basic handling skills can be distracting and impair a rider's perception or reaction time. Over half the groups mentioned that a willingness to learn skills and acquire knowledge (such as safe following distances) was crucial to becoming a safe rider and most participants appeared to agree that there was value in professional training, even for experienced riders. For some riders, good road practice included lane splitting (i.e., the practice of riding up between two lanes of traffic) as they argued that this helped them to stay ahead of the traffic and be in a safer position. Others argued vehemently that this was an unsafe practice.

> *"The safest place to be is in front of the traffic – be clear of the traffic. So I lane split at traffic lights to get to the front. There is not a car that can out-accelerate a bike, so I can clear the traffic."* Male, Group 2.

> *"Splitting traffic or weaving through traffic in peak hour is unsafe."* Male [different from above], Group 2.

A few participants suggested that a safe rider was likely to plan their route in advance. All participants agreed that a safe rider would ensure his or her motorcycle is kept well maintained and check regularly for proper fluid levels, tyre pressure, functioning lights, and chain and tyre condition, yet not all rode well maintained motorcycles (for financial reasons).

There was no consensus on the safety benefits of wearing protective clothing. Some participants stated that a safe rider would always wear good protective clothing. Others said that when they put on protective clothing they take more risks than usual as they are less likely to get hurt if they come off, whereas wearing little protective clothing provokes them to ride more safely.

> *"Protective clothing doesn't make a safe rider, but it helps if you come off. Some people think that if they come off they will slide along the ground like they do on TV races and therefore they take more risks 'cause they think they are less likely to be hurt.*" Male, Group 7.

> *"When you get in full leathers … you will push it harder as you feel safer in the full gear. If you don't have the gear on, you ride more carefully, more stable, more defensively."* Male, Group 1.

> *"Sometimes I'll jump on the bike just to go round to the shop in shorts and a singlet, so I'll be very careful. But if I'm in full leathers I have a little more confidence about my skin so I'm willing to try that little bit more."* Male, Group 5.

There was also no consensus on the relationship between being a safe rider and following road rules. Whilst some participants stated that a safe rider always follows the road rules, most did not seem to hold this view. (See section 3.3.5 on police and road rules for more on this issue).

On the subject of crashes, there was some debate about whether having no crashes meant a person was a safe rider. Some agreed with this, others reported that having crashes was more a matter of chance than a reflection of safe or unsafe riding. Examples were given to support the 'chance' argument such as riders waiting at red traffic lights and being run over by a car coming up behind them at the lights; or oil or debris on the road leading to a crash. Most often when people said that a crash was not their fault, other riders in the group would challenge them on this assertion, asking them if there was anything they could have done to avoid or get out of the situation. This was an interesting process as, on some occasions, the person in question would reflect on the crash differently and agree that they may have been able to change the outcome by acting differently.

There appeared to be a distinction in many riders' minds between 'crashes' and 'learning experiences'. It seemed that a 'crash' involved other vehicles or resulted from unthinking rider behaviour or bad luck; whereas, 'learning experiences' resulted from the rider taking a calculated risk, even if injury occurred. There were many riders who indicated that these types of crashes (resulting from their own considered choices and which did not hurt anyone else) were simply part of the process necessary to become a proficient and safe motorcyclist.

> *"I think if you go to the track and you break an arm, you just think that's part and parcel of it – it's a risk you take*." Male, Group 6 [talking about riding on a motorcycle race track].

> *"Everyone should learn to ride on dirt so they can come off and not get so hurt and also to learn how it feels to have the bike slip out from under you*." Male, Group 7.

> *"Each time you fall off, you learn your limits and learn how it feels so it makes you more careful. … You don't need to crash to be a safer rider, but if you do, it certainly teaches you that you are fallible and makes you think about what you are doing*." Male, Group 1.

> *"Everyone who buys a bike knows that they could die and it is only a matter of time until you stack it. … but you think, I've bought the bike, I accept the consequences."* Male, Group 5.

3.3.2 What is an unsafe rider?

Not surprisingly, the opposite of what constitutes a 'safe' rider (i.e., not being aware, focussed, or staying within your limits) was the first response to this question by most participants. In addition to these factors, the most common theme to describe an unsafe rider was a poor attitude. This concept appears to apply to riders who do not think about the consequences of their riding, leading to them to impulsive, risky actions or to overestimate their abilities. It was also expanded by some groups to include riders who do not take responsibility for these consequences, blaming other traffic or conditions for their crashes.

> *"Lacks respect for others or themselves or their machinery."* Male, Group 8.

> *"Poor attitude – attitude cannot be changed. They will show the instructors what they need to get their licence."* Male, Group 3.

> *"Bad attitude. What goes in is what they have got away with – they are lucky."* Male, Group 1.

> *"Comes down to attitude. Are you just another vehicle on the road or do you use it as a race track? I have a motorcycle therefore I <u>can</u> do things like lane split. They do things because they can, not because they should. Even if they are well trained, they feel invincible and think they can get out of any situation. They are not thinking about the consequences of what will happen to them. Think they know everything. You can have great ability which might help you walk away from a crash that might cause serious injury to another person, but if you have the wrong attitude you will crash."* Male, Group 4.

Other factors raised in the discussions which related to unsafe riding were: riding fatigued, inexperience (including new riders, riders who have not ridden for some time, infrequent riders, and inexperience on a particular type of motorcycle), giving in to peer pressure and pushing yourself past your limits, bad riding habits (such as not checking the mirrors, not providing enough indication before changing lanes, not maintaining a visible place on the road), poor basic handling

skills, a lack of knowledge about safe practices, not wearing protective clothing, and riding a bike too powerful for your ability.

> *"Inexperienced riders may not know when they are at risk. They might be concentrating so hard that they don't see much more than what is right in front of them. They might not understand what is happening until they are out of their depth*." Male, Group 1.

> *"If the mates do it, they will do it. ... Peer and third party information form their belief. ... They have preconceived ideas of what is a good rider; think that doing 120 (km/h) on their back wheel [wheelies] makes them a good rider."* Male, Group 3.

> *"Cruiser riders might be a bit more complacent in their scanning than sports bike riders .... On a cruiser it is physically harder to check over your shoulder than on a sports bike. Also your attitude affects scanning, I think you are more laid back on a cruiser, so you can get complacent."* Male, Group 2 [talking about how different styles of motorcycle can have both a physical and psychological effect on riding practices].

> *"There is a lack of knowledge and misinformation at the public education level, like the time needed to notice and react to a hazard isn't mentioned in the ads about braking distance."* Male, Group 3 [talking about motorcyclists who are unaware of important safety information].

Riding between two lanes of moving traffic (i.e., lane splitting) was considered a risky practice by many (but not all), although about half the participants stated that they had done this on at least one occasion. Opinion was divided over the safety of riding between two lanes of stopped traffic; however, only around a quarter of people interviewed said that they would never ride between two lanes of stopped traffic, many arguing that the risk of being crushed between cars when stopping in the legal position (behind a car) was greater than the risks involved in riding between the traffic. This issue is discussed further in section 3.3.5 which explores whether police and road rules contribute to rider safety.

Several groups mentioned that an unsafe rider does not consider their behaviour may hurt other riders or people who care about them.

> "[whether a rider is risky or safe] *depends on the risk they are taking - if it is only endangering their life, or others. If others, then it is unsafe."* Male, Group 3.

> *"People who just pull their dirt bike out of the shed, the bike is unregistered, unroadworthy, drops oil everywhere ... and you come along behind them and slip on their oil."* Female, Group 6.

> *"Not thinking about the worst that can happen. For example, the worst thing that might happen to you is that you die – but what about your family? What if I fall off and am in hospital? How do I pay for the hospital, what happens to my family while I'm recovering? How it impacts on others is important to think about."* Male, Group 4.

3.3.3 What are the advantages and disadvantages to riding safely?

The advantages of riding safely raised by most people were: living to ride another day; avoiding injury; keeping your licence; and avoiding motorcycle repair costs. Some participants mentioned that they explicitly thought of their family when riding and wanted to come home to them. Some riders mentioned safe riding was important to their image, either professionally (if riding was crucial to their job) or socially (not looking like a "dickhead" [i.e., foolish] in front of others if they happen to come off).

Most riders agreed that they could get enjoyment from riding safely and that a safer rider chooses their times and places to be risky. To get enjoyment from riding safely, an element of challenge was still required by most of the riders interviewed. Some riders chose to do this legally, whilst others took pleasure in choosing their times and places to take calculated risks such as speeding and stunts. Regardless of the legality, the sense of mastery over the machine seemed to be a key element in many riders' descriptions.

> *"I have more fun riding up around Peachester around 30-40kph rather than doing 180kph down the freeway. It is just that feeling of cutting into a corner and coming out of it and being alive at the end of it."* Female, Group 2.

> *"There is a sense of achievement in getting everything right, taking the corner perfectly rather than fast ... you can have legal fun on windy roads that have 30kph corners but a 60kph limit, taking each of those corners legally and technically perfect."* Male, Group 4.

> *"You pick your times (to an extent). You will be riding along and then all of a sudden you will think, 'oh I might give it a bit of a tickle'."* Male, Group 5.

Another advantage of riding safely mentioned by some groups was not hurting others.

> *"You can make sure you don't hurt anyone else. If you hurt yourself, it is your own fault, but if you are going through the city scraping it on the ground, that is not the time to do it. That is just asking for a coffin."* Male, Group 5.

> *"I think the biggest influence you can have is your loved ones around you. I mean, if you're not capable of wiping your backside, someone has to do it for you. To become a burden on my family is the biggest issue for me. I can honestly say that I always leave a 10% safety margin around myself. I still mix it with the boys, but they just do dangerous things and I don't do them because of the experience I've been through"* Male, Group 6 [talking about how losing a family member in a motorcycle crash has tempered the way he rides].

Although most riders stated they could still have fun when riding safely, there was a general sense within most of the groups that challenging yourself and your limits was crucial to the enjoyment of riding. Therefore, there were some riders who suggested that boredom would be a disadvantage of riding safely.

> *"It would be too boring. There'd be no thrill. If I wasn't going to ride at my full potential, I'd be better off* [safer] *in a car*." Male Interviewee.

One group mentioned that going too slow (even if at the speed limit) can be dangerous for a motorcycle rider. Although technically 'safe' and 'legal', other drivers may get impatient and run them off the road. Two groups mentioned that race days (i.e., track days) allowed people to

develop skills and test their limits in a relatively safe environment. However, motorcycles are not insured during these events and these groups pointed out that some people may be tempted to use the unsafe option (e.g., racing up public mountain roads) so that if they came off they would be insured. Another disadvantage to riding safely mentioned by some participants was that being too safe a rider may be potentially damaging to a rider's image.

> *"There is a perception that a safe rider is lame, or a geek, or has no balls."* Male, Group 4.

3.3.4 What are the advantages and disadvantages to riding unsafely?

Most groups were able to think of some advantages to riding unsafely. Most commonly cited was 'the adrenaline rush'. One participant described the following:

> *"Riding for pleasure and what you get out of it has been likened to your investment policies, the higher the risk, the higher the rate of return and with motorbikes I find it so addictive that if I ended up in hospital I'd be counting the hours before I could get back on that bike because it is just such a wonderful, free, swooping, low flying sensation – I don't think anything could stop me riding now."* Female, Group 6.

> *"Physical injury is not guaranteed, there's only a 10% chance of permanent injury compared with a 90% chance of not permanent injury, so it is worth taking the risks. The adrenalin rush is exciting."* Male Interviewee.

> *"The rush is an escape from normality and even if you know you are pushing your limits and even if there are risks involved – that's part and parcel of it."* Male, Group 5.

The next most common response to this question was the concept of impressing others, be it competing with other riders, or showing off to other traffic, mates, or members of the opposite sex. One rider provided a unique response, stating he sometimes rode unsafely to "piss the girlfriend off". He described how, if he is upset with her, he will deliberately perform dangerous stunts to annoy her. Many groups discussed the fun of competing with other riders. This competitive environment appears to illicit a strong desire, in many individuals, to push their limits and prove themselves as good riders.

> *"You will always try to ride to the environment. If you are with a group you will only keep up with them, or try to keep up with them, or back off. Backing off is least likely as you want to stay with the group and not be classed as slow, or not a proper rider because you can't go fast. Motorbike riding is all about how good you are - it's about impression."* Male, Group 5.

> *"There is a close relationship between high performance bikes and the race track bikes, so there is that image, or that urge to try those things. You can do that safely on the track but on the road there are so many factors you can't foresee, that are out of your control – but it's quite easy to put a lot of those things into the back of your mind ... especially when the road is right and you're thinking "this is great!", you're not thinking about* [unexpected hazards]." Male, Group 6.

> *"It's about ego, testosterone, their masculinity is restored. They get to show off and show they are better than others. ... Get to show off to the cars too, saying 'I can do what I like!'* Male, Group 4.

As mentioned in the previous section under 'safe riding', some riders suggested that riding "unsafely" made them safer. For example:

> *"Riding a bit faster makes you sharper and more focussed so you are safer. When we go on really fast rides, where we do it, and when we do it, means we are safer than some of those Saturday rides when people are going a lot slower. Never had a single accident on those rides."* Male, Group 2 [speaking of high speed rides (180kph+) conducted on week days in country areas where there is good visibility].

> *"Adrenaline helps you to respond quicker, helps you to go to the limit and make the minute corrections required to keep control."* Male Interviewee.

Escapism and freedom were commonly associated with more unsafe riding practices by the participants.

> *"For those few seconds when you are doing something dangerous you have nothing else on your mind but what you are doing. You're not thinking about shopping lists, your girlfriend, or who is going to miss you when you're gone. You are thinking about riding your bike, and that's it."* Male, Group 5.

> *"When you get on a bike you don't think 'oh there might be something bad up ahead'. You don't think about those things – you clear your mind of those things. That's part of the release."* Male, Group 6.

All participants could think of at least one disadvantage to riding unsafely. Disadvantages included death, injury, the pain and cost of injury, emotional, physical and financial burdens that may be placed on friends and family, losing their licence or job, being fined by police, damaging their motorcycle (both the financial cost and the emotional pain), and injury to pride and image from coming off.

3.3.5 How do the road rules and police affect your safety?

Most groups did not hold the opinion that the police or road rules played a large role in their safety; although, it was commonly raised that a police presence has the effect of slowing traffic down, albeit, temporarily. Two groups suggested that this can be a hazard as car drivers may brake suddenly or behave otherwise erratically when they see a speed camera or police car, putting the motorcyclist in danger. This issue was of particular concern in wet weather or other conditions where the road surface is more unpredictable.

Attitudes towards police were mixed.

> *"Police have an attitude of 'do as I say, not as I do', like, coppers will lane split."* Male, Group 1.

> *"Police should model good behaviour. You see them in short sleeves. They don't wear proper protective clothing."* Male, Group 8.

> *"I think the police do a great PR job, but when you see them sitting on Coronation Drive busting people for 10km over [the speed limit] they get a bad rap. ... Police give you a reality check and that's healthy, how else are you going to get one without getting hurt?"* Male, Group 6.

"Police pick on motorcyclists. They pull them over for licence checks all the time. I've seen them let cars go that are going faster, but pull the bike over for a licence check." Male, Group 2.

"The police only affect riders that are already basically safe …high risk riders will run from the cops as it's fun. They don't think of the consequences of their actions so there is no thought of what will happen if they are caught. A normal, decent, person will slow down when they see a cop car … risky riders might take their number plates off and race up Mt Glorious." Male, Group 4.

"If you see a cop car, you go 'Oh' and slow down and you stay more careful for a while after you've seen them. If more riders knew the legal consequences of splitting lanes and stuff like that, you'd be a bit more wary of how often you do it, because it is pretty hefty. But they can't just pull out of the traffic and get you when you lane split because you are already past them and gone, so it's often an unpoliced issue." Male, Group 5.

"Police can cause accidents because you think "Oh shit! Motorcyclists tend to look out for cop cars because we tend to ride a bit faster." Male, Group 1.

"Police don't affect my riding in the city, but in the country they are a pain in the arse. If I hear they're out, I'll choose another route. I don't want to get booked." Male Interviewee.

"If everyone stuck to the road rules, we wouldn't need police and there wouldn't be any crashes. Most people don't understand or know the road rules." Male, Group 4.

However, road rules were not always seen as being conducive to motorcycle safety, or completely adequate for motorcyclists.

"Following the speed limit can be a hazard because you are looking at your dash to make sure you don't go over the limit, rather than reading the road conditions." Female, Group 6.

"Speed limits in some cases are way too low for sensible riding. It's been proven in Europe that the higher speed limits in country areas causes less accidents because people are concentrating on their driving or riding. If you ride at 100km per hour, your brain is somewhere else because you don't have to concentrate. You are not focussing on what you should be. When they originally made the speed limits the cars and bikes weren't as safe as they are now. Cars and bikes now are designed to go faster and stop faster." Male, Group 2.

"The road rules are not specific for motorcyclists, so are inadequate. Motorcyclists like to make up their own road rules. Rewarding good behaviour can work better than penalties [he states a NSW seatbelt experiment achieved 93% compliance by rewarding the behaviour] .. but the penalty system must work. Upping the penalties can have a reverse effect because it makes people so nervous that it is a stress." Male, Group 4.

Speeding is a common offence committed on Australian roads (by all types of road users). A recent Australian survey found that 89% of respondents reported that they sometimes broke the speed limit (AAMI, 2005). It is, therefore, not surprising that most motorcyclists interviewed admitted that they exceed the posted speed limit on occasion; however, there were some riders in almost every

group interviewed who regularly rode at very high speeds (i.e., around double the posted limit on country roads). Often this issue was discussed in relation to group riding behaviour or pushing their own personal limits (comments relating to speeding behaviours are discussed in sections 3.3.4, 3.3.9, 3.3.10, 3.3.11).

The idea that a 'safe rider' was a person who carefully chose where and when to speed has been discussed previously in this Chapter, along with the theme that riding at speed increases focus and concentration, making the rider 'safer'. In addition, very few participants equated staying to the speed limit with safety. Whilst most participants agreed that they could achieve an adrenaline rush, within the speed limit (as discussed previously), most of these people also said they enjoyed the thrill of riding fast and appeared to be of the opinion that, provided they didn't hurt or endanger others by their actions, speeding on public roads (at least in country areas) was OK.

> *"I ride extremely fast, but I ride responsibly"* Male, Group 2.

> *"I can only go 190kph on my bike, that's as fast as it can go. There's nothing like leaning over, going round a corner, at 190ks."* Male, Group 5.

High speed in built-up areas was generally considered irresponsible and foolish (this is discussed in section 3.3.14 which explores what riders consider 'the wrong thing to do').

> *"The thing is, you don't ride fast in the city. When we ride fast, we get out where there is no traffic, and there is nothing there, so you've got a bit of responsibility about where you do these speeds."* Male, Group 2.

However moderate speeding with an urban environment was not considered dangerous by most participants.

> *"Most motorcyclists travel 5-10km over the speed limit. You can work your bike quite competently at speed in moving traffic."* Male, Group 1.

Several groups mentioned that the style and image of the motorcycle influenced speed.

> *"Modern bikes are fast and smooth, it's easy to go over the speed limit without really knowing it."* Male, Group 7.

> *"You hop on an XJ and you're just riding – hop on an R1 and you start feeling like having fun – the pressure comes from the bike. Upright positions are more cruisey whereas sports positions are more about speed."* Male, Group 1 [an XJ is a sports-tourer style of motorcycle whereas an R1 is a sports style motorcycle].

> *"A cruiser is built more lay-back, an armchair type position, so you've got nothing to prove. You might want to see how it handles, but on a sports bike you are leaned over in a sports position – the speedo is right there in front of your face."* Male, Group 5.

> *"You shouldn't go too fast on a 250* [cc]*, but a big road bike is designed for speed so it's much safer to go fast."* Male, Group 2.

> *"What wins on race days, sells on Mondays."* Male, Group 1 [discussing how professional motorcycle racing influences sales. Several groups discussed how design innovations for professional racing motorcycles lead to designs for faster on-road motorcycles].

Most riders interviewed admitted to lane splitting or riding up the road shoulder on some occasions, as mentioned earlier in section 3.3.2. The majority of riders appeared to hold the opinion that lane splitting was relatively safe if the traffic was stationary (e.g., at traffic lights) but not as safe between moving traffic. Most riders interviewed believed lane splitting to be illegal[1], often because they have known people who have been booked whilst performing this behaviour. However, the general perception seemed to be that lane-splitting is acceptable for the following types of reasons: a) it is 'safer' to lane split; b) it is better for the bike as it doesn't overheat in traffic; c) it is better for the traffic flow; d) in other countries it is legal, so this proves it isn't really unsafe; e) police motorcyclists do it, so if it is OK for them it should be OK for us; f) it is one of the advantages of riding a motorcycle, to get through the traffic.

The disadvantages people bought up about lane splitting and riding up the inside shoulder were: a) that you need a certain level of experience to do it safely; b) you need to be alert for people changing lanes or throwing things out their windows; c) you need to beware of discarded items on the shoulder such as old car batteries, and; d) you need to hope you don't get booked by the police.

> *"Lane splitting is OK at any time provided it is done at a reasonable way and at a safe speed. You must look ahead and watch the cars, watch if they look in their mirrors, if they start to turn - they are all little signs you look for, that you get used to if you do this sort of thing. The advantage of being on a bike is that you can get through the traffic and when there is 2km of traffic and you are going to sit back there, my bike is going to overheat because it is air-cooled and its got to be moving or it will overheat. The thing is if you lane-split at a safe speed, which you can do, it keeps the traffic flowing, you're not holding up traffic and you get through it quicker. That's one of the advantages of riding a bike."* Male, Group 2.

Drinking and riding did not appear to be a common behaviour amongst the motorcyclists interviewed although some reported drinking and riding in the past, or knowing other people who drink and ride. Only two groups interviewed specifically mentioned this behaviour.

> *"A big 'no-no' for most of the people I know is even one drink – don't drink and ride."* Female, Group 5.

> *"[Alcohol] affects me so much that most of the time I won't drink because there is a chance I might want to ride. I will go out with my mates on a Saturday night and have only one drink because I know I might want to get up at 5am or 6am the next morning and go for a ride. Since I've had a bike, I basically don't drink."* Male, Group 5.

> *"I won't go to Philip Island any more because they stop at 4pm and drink till 2am and then they are on their bikes at 5am."* Female, Group 6 [talking about the group ride from Queensland to the Philip Island bike races].

> *"In my circle [guys that like to race] I don't see drinking and riding at all."* Male, Group 6.

[1] There is no specific offence in Queensland for lane splitting. However, there are at least four sections of Queensland road rules which provide police with the discretionary power to book riders for this behaviour: Section 140: 'No overtaking unless safe to do so', Section 141: 'No overtaking etc. to the left of a vehicle', Section 146: 'Driving within a single marked lane or line of traffic', and Section 150: 'Driving on or across a continuous white edge line'.

3.3.6 Who do you discuss your riding with? Do you ever discuss safety issues?

Almost all participants said that they discussed their riding with fellow riders, and were willing to discuss their riding with anyone else who expressed a genuine (positive) interest. Participants who belonged to motorcycle clubs stated that safety issues are discussed at club meetings, including road conditions on local roads and specific routes prior to club rides.

Some riders expressed the view that most non-riders only wanted to discuss how dangerous it is to ride a motorcycle. The opinions of non-riders did not appear to have credibility or relevance in the eyes of riders so they generally did not influence their riding behaviour. Many riders mentioned how they learned safety information by sharing stories and experiences with fellow riders.

> *"I had an uncle who almost died from a crash. He has told me what happened to him and I think about that. I have friends who send me emails, jokes, and stuff but occasionally the serious one – pictures of motorcycle crashes [gory pictures etc.] ... but in that minute, instant, second that you are on that bike, you think 'right, I'm going to do this'. You know the consequences, but it just happens. You know the danger factors of it, but either something is going to happen or it's not."* Male, Group 5.

> *"Yeah, I've seen those pics. I didn't take much notice of those gory pics of motorcycle crashes because I didn't really think it related to me. But now I've had three friends who have been hurt [he recounts the details which included one fatality] ... so even if it is a friend of a friend, it is closer to you. You think, Gee, that actually happens. It could be me, it could happen."* Male [different from previous], Group 5.

> *"You tell stories about your experiences, entertaining stories ... yes, learning [safe riding] occurs through story-telling, especially about other traffic."* Male Interviewee.

For several riders interviewed, motorcycle riding was a bonding experience they shared with their partner, or other family members.

> *"As a couple, we are in a fortunate situation because we can talk to each other about it [riding] and we talk quite intimately about how we feel about motorcycle riding, whereas we wouldn't talk the same way with other riders we know. Our son has recently begun to ride too and he will talk a lot with his father but not with me. He doesn't relate to me."* Female, Group 6.

For others, their riding was something they deliberately did not discuss with their families as they did not want to worry them.

3.3.7 How do other important people in your life influence your riding behaviour?

Many riders expressed that their family influenced their riding behaviour.

"My wife would have my guts for garters if I didn't wear good protective clothing. She'll divorce me if I don't wear my gear." Male, Group 7.

"My missus [as a pillion], she whacks me if I'm going too fast." Male, Group 3.

"Yeah being married [affects the way I ride]. I stick to my limits for her sake." Male, Group 3.

"When my child was born, I sold my bike because I know how dangerous it is. But then the bug got me back." Male, Group 3.

"When I ride with my girlfriend, I ride the way I like to be seen riding. I want to make sure she's safe, so I ride by the rules when I'm with her. She's not as experienced as me. ... If I see a car making a stupid move or something, I'll put myself between the car and her." Male, Group 5.

"I lost a brother on a bike and I wouldn't put my parents through burying another child, but I know people who have." Male, Group 6.

"The responsibility of children can make you more mature. Also people who have career prospects. Single tradesmen and labourers are cashed up, they don't care. They are the fastest guys on the road. When you are single, you're carefree and you only need to think of yourself." Male, Group 1.

"... but I would never lane split in front of my son. I ride very differently when I am with him. My son is probably a better rider than I think he is, but I hope I'm never going to show him bad habits that I've picked up." Male, Group 6.

"Now that my granddaughter is born, that sits in the back of my mind. What if I don't see her grow up? Now I think of that since my bad accident." Male, Group 2.

Only one rider explicitly stated that his family had no effect whatsoever on the way he rode. However, several others mentioned how riding can be an escape from family responsibilities (see section 3.3.2 to recap this).

"When you get on a bike, it's just you – not your family – so you ride the way you want to ride." Male, Group 2.

Work considerations were a particular consideration for the police and riding instructor groups. Many expressed that they had "a responsibility to behave." The police officers described the considerations they must weigh up before embarking on a chase. Whilst their duty is to uphold the law, a risk assessment process was described which took into consideration their own safety, the safety of other motorists, and the safety of the person being chased. The officers undergo extensive rider training so have confidence in their abilities to handle a motorcycle; however, being a police officer on a motorcycle carries its own inherent risks; both innocent (drivers doing 'silly things' which can cause a crash because they see a police vehicle and become nervous) and deliberate (criminals running them off the road). However, being on a motorcycle was a large part of their job satisfaction. As one officer said:

"Motorcycle riding is a passion. It's hard to get into police motorcycle sections, someone has to die or retire. ... Many motorcycle police would quit if they had their bikes taken off them."

Instructors also reported a love of riding and discussed feelings of responsibility to model good behaviour in front of their clients. A few instructors indicated that this sense of responsibility extended to all their riding, whereas others stated they rode more carefully (and legally) when they were in charge of learners but enjoyed a more flexible riding style when not at work.

> *"Instructors must maintain a safe image for the company. Novice riders will put you on a pedestal so you have a responsibility to them. You need to lead by example, all the time – not just when you are at work. I won't have credibility if I'm caught doing the wrong thing."*

> *"Lane splitting when traffic is stationary is OK, but we don't tell learners that. More experienced riders are better able to do it than novice riders. You are better able to assess the conditions around you."*

> *"As instructors, it can be fatiguing to follow learners who don't know what they are doing, but once they have gone and its time to go home, you wake up and want to get into it."*

Many participants mentioned that at least some of the people they ride with were important in their lives. Although some riders will go on group rides with people they don't know very well, most of the people who took part in this study rode with at least one other person with whom they had a strong emotional tie (such as a family member, partner, or close friend). The issue of group riding is discussed in section 3.3.11.

3.3.8 How easy is it to always ride safely?

The vast majority of participants said that it would be very difficult for them to ride safely all the time. 'Safe' did not necessarily mean 'legal', and whilst some riders stated that they may be able to ride 'safely', most admitted they would have difficulty riding within the road rules all the time, and suggested that keeping to the road rules is sometimes unsafe. Several groups mentioned that the amount of concentration required to be 100% safe was impossible to sustain over long periods.

> *"It takes effort* [to always ride safely]*, you need to plan for it, have mental preparedness. You can't give into that instant gratification. There is always temptation which you need to resist."* Male, Group 3.

> *"It's easy, but you need to think about it all the time. … You know the capabilities of your bike, and you know you could do that [what others are doing], but you don't because of the consequences."* Male, Group 4.

> *"Impossible. You become unconsciously competent (where your brain goes into neutral and all the automatic stuff - you just tune out). The more experienced you are, the more likely this is to happen. Then you might see a movement or something, so switch back into explicit* [full attention and concentration]*. It is just too draining and mentally fatiguing to be in explicit mode all the time."* Male, Group 1.

> *"It's very hard to maintain concentration all the time."* Male, Group 7.

> *"You can't always ride safely as you don't have 100% concentration all the time. … But we try because we've got too much to lose – we are the ones who will get hurt."* Female, Group 2.

"It is possible to ride safely all the time by keeping your bike maintained, by being willing to adapt to the situation, be willing to give up your keys if you've had a big night out and you're tired. You need to be willing to compromise and adjust to the situation. But you are never in complete control as the unexpected could always be around the corner. You can control your speed, but not your environment." Female, Group 5.

"It's easy for me, but I have a very wide concept of 'safe'." Male, Group 6.

"Why would you? [Attempt to ride safely all the time.] *That would take all the fun out of it."* Male Interviewee.

Other factors that groups reported as affecting their ability to ride safely were fatigue, dehydration, diet, the effects of a big night out, and general fitness level. Mood and stress were also raised, with both general life stress and stress resulting from riding being mentioned (e.g., traffic conditions or errors like stalling the bike). The issue of fatigue was raised, but several riders reported that the adrenaline associated with riding a motorcycle negated any effects of fatigue.

"Even after a long day at work, you will take the long way home. It is refreshing and an adrenalin rush." Female, Group 1.

"If you are travelling in traffic, a lot more is going on, so you are alert. Travelling on a freeway is where you are going to get tired because it is boring and there is nothing to do but go straight. Also they are designed with those cement walls that block our vision." Female, Group 2.

"Even after an exhausting day, I might have my eyes hanging out of my head, but I can get on my bike and ride for six hours and come back feeling more refreshed." Male, Group 1.

"When you've had a big night and you are quite tired, maybe you want to get home a bit quicker because you're tired, and that is when you might have an accident." Female, Group 5.

Some groups mentioned that a person who has a lot invested in their motorcycle is more likely to ride safely as they want to look after it. It was not uncommon for riders to express an emotional attachment to their motorcycle and several exhibited pride in having a 'good looking' machine that others would admire.

The group a person is riding with also effects how easy or hard it is to ride safely. The temptation to stay with the group, even if they are riding at a speed either slower or faster than what the rider is comfortable with, appears a strong influence for many riders. This issue is discussed in sections 3.3.9 and 3.3.10.

3.3.9 Have you ever felt pressured to ride in a way you'd prefer not to? What led to this?

At least half the riders interviewed indicated that they had felt pressured to ride in a way they would prefer not to on at least one occasion. The overwhelming response to this question related to group riding / peer pressure, although many riders also alluded to this pressure being ultimately an internal pressure to get the 'rush' or 'thrill', or to somehow 'prove' yourself to others.

"If you are riding with people that are more experienced riders, and their abilities are better than yours, there's pressure to match that – or at least to extend yourself

and your abilities … and the pressure to get more of that thrill. I guess any form of peer pressure, you still have the choice to say no. There are groups I've ridden with where I refuse to try to match because I've decided that it's just that much beyond my own limits, so I just ride my own ride." Male, Group 5.

"It's ego, testosterone. If someone flies past you, you just want to go. There's the thrill, the risk of getting caught or not caught." Male, Group 3.

"Yeah, it's annoying when you're at the front and you're caning along and you think you're going really good – and you look in your mirrors and that guy is still right behind you!" Male, Group 6.

"If you buy a new bike, it's 'Hey now – what are you made of?' And if you are with a group of mates you don't want to embarrass yourself so you want to keep up with them and it is a thing of 'I can handle this! – oh, no I can't – oh, yes I can – oh, no I can't." Male, Group 6.

"People riding in a group don't want to be left behind so might try to keep up whether they can or not because they don't want the others to say "oh, he can't keep up." Older guys don't worry about it as much, but younger guys in a group – all matching bikes and leathers, they will push themselves even if they are well out of their comfort zone." Male, Group 2.

"My workmates went out … but they stuck at 100kph and I'm thinking "I waited all week for this ride – wake up! This is my favourite bit of road - bye! … I don't get much enjoyment from riding with other people unless they are my kind of riders and they ride up to the speed. I enjoy riding the road and if they are with me on the road, yeah great, but I'm not into competing." Female, Group 6 [speaking of how she felt pressured to hold back to stay with the group].

"There was more pressure when I was younger. I remember crashing my bike at the Regatta Hotel after an evening of drink. We were just riding home and showing each other the wheel and I hit some gravel going wide and wrote the bike off. But I feel that effect far less now. I can control a lot better now and I don't drink and ride." Male, Group 6.

Other sources of pressure mentioned were other traffic and image.

"If car drivers are tailgating you, you feel pressure to just get out of there – so might go well over the speed limit." Female, Group 1.

"Motorcyclists might pressure car drivers too as we want to get in front of everyone. We can do what we want." Male, Group 1.

"I've ridden in a group and ridden quicker than I know I should just to prove my bike." Male, Group 5.

"Sometimes you are just riding to the pressure of the bike. The bike can go fast. It wants you to go fast, even if you can't handle it. It's the image and the bike and the marketing. … Young blokes have the red and black bike, the red and black helmet, the red and black jacket and boots to get the image. His mate has that image too and can ride that quick, so the young bloke thinks he should be able to ride that quick. My mate has the same bike and can ride that quick, so I should be able to keep up." Male, Group 1.

3.3.10 Have you ever pushed your limits? Why?

What riders term 'pushing their limits' is clearly one of the attractions of riding as almost every participant reported engaging in this behaviour. The concept refers to a (usually) deliberate decision to push through their personal comfort zone as a rider. Often, this behaviour includes high speed riding, but this is not always the case. People push their limits for different reasons. Some of the reasons listed were to improve their skill, to get a thrill, to relieve boredom, to feel a sense of accomplishment, to show off or compete with others, and to have mastery over their fear. Many of the advantages listed for unsafe riding in section 3.3.4 relate to 'pushing the limits'. Whilst group riding often gave people an opportunity to push their limits, most riders stated they would push their limits when riding alone as well. Some of the reasons for pushing the limits are listed below.

> *"It's the competition, competition with yourself, and with others."* Male Interviewee.

> *"It's modern society, isn't it? The extreme factor, just take it to the nth degree? Ego plays a large part of it, keeping up with your mates, being in with the crowd. But really, you do it for the enjoyment. There is a lot of pleasure in riding, and going a bit quick and taking the corner right."* Male, Group 6.

> *"To get better, faster, to better yourself. We want to learn to ride faster, brake faster ..."* Male, Group 1.

> *"It's good to know what your bike can do, but sometimes you push it and think 'wow this isn't what I planned to do' - oops - crash."* Male, Group 3.

> *"What influences you to push your limits one day might not be the same as what influences you another day. I think how enthusiastic you are to ride at that specific time influences what you will do at that specific time. So if I'm just going for a ride, and someone pops a wheelie, I just go 'whatever' and keep going. But if I've been riding with my mates and you're all hyped up and someone pops a wheelie, you go 'Yup' and go straight through it."* [i.e., you do it too.] Male, Group 5.

> *"A long straight stretch of road can be boring, so you put on a bit of speed or push your limits to relieve the boredom."* Male, Group 7.

> *"I went to a track day and came off about six times, but I regard that as a sport. These are certain risks within a defined parameter. I wouldn't do that on the road, but I increased my confidence even though I fell off because I learnt how far I could go and how well I recovered ... and I thought 'hey, I'm alive, Yee-ha!'* Female, Group 6.

When asked if your personal limit varied, or how you could tell when you were at your limit, there was variation in the responses.

> *"You can't extend the limits of your riding, without riding at your limit."* Male Interviewee.

> *"Each time you fall off, you learn your limits and learn how it makes you feel, so it makes you more careful."* Male, Group 1.

> *"I'm lucky the way I listen to myself. I get a gut feeling. If the bike doesn't feel right, or something doesn't look right, I will back off. An inexperienced rider might not know what their limit is as they don't have the experience to know that if*

the bike is doing 'this', then it is about to jump out from under them." Male, Group 5.

"Usually you don't know your limits until you are sliding along the ground." Male, Group 7.

"Limits are continually moving. The more you survive, the more you can push them away. Everyone pushes themselves past their limits, that's part of motorcycle riding. Every time you beat your limit you are moving into a higher risk because you keep pushing yourself. One day, that luck, or chance, or knowing that limit, is going to be at its peak." Female, Group 5.

"It comes to a scare factor, like 'I scared myself today.' I'll go for a ride and think 'Oh, I got one scare factor today, what did I do there? Maybe I can do that a bit better?' Another day I'll go for a ride and a similar thing will happen but I won't get scared and I'll think 'Oh, I've worked through that.' I think you just nudge it, nudge it, nudge it until you scare yourself." Female, Group 6.

"I think it's elastic, it's between your confidence and your performance. Sometimes your confidence stretches further than your performance and you just get snapped back that little bit and you go 'Ah, that wasn't what I meant to do!' And then you stretch it again. You don't stay in the same place, you stretch and contract, stretch and contract." Female, Group 6.

"Sometimes you find your limit accidentally. Like, you might know you can take a corner at 70kph, but coming into it you look down at your speedo and realise you're doing 90kph, and you think 'Oh Crap!', so you lean it over and try to get around the corner, and if you make it, this might become your new limit." Male, Group 5.

3.3.11 What do you think affects the way you ride?

Other riders were most frequently mentioned as an important influence on riding behaviour.

"[If I'm riding with the group that likes to go out on the race track] They say "tuck in behind me, if you can keep up" - so they give me a challenge – me, at my age, I accept the challenge, so at the same time I'm learning." Male, Group 5.

"Group riding can help people learn how to ride. You notice what others do more and more, and your perceptions change as you watch others. But you might pick up bad habits as well as good habits." Male, Group 2.

"You should always ride with people who can ride better than you. They might go a bit quicker than you are comfortable with, but you will try to keep up, so the adrenalin will be pumping - because you're nervous and you want to keep up – but you will learn to ride better because of that. They will talk to you and ask you stuff like, when you go round a corner, do you scan ahead of the corner?" Male, Group 2.

" ... and you'll come up to a corner and you know they're doing their very best, so you take them on the inside .. it's a bit of an insult, so you don't take that lying down, you give it more and more and more. It's easy to goad my friends into having a little race - not that I need to, they're self starters." Male, Group 6

"I ride differently when I am with my friends than when I am with my Dad, but not saying I ride much more dangerous or anything, just that it is different. It's because of my relationship with them, compared to my relationship with my Dad." Female, Group 5.

"Riding with family, you ride most within your boundaries as you don't want to come off in front of your family … When you are riding with your friends, that is the next safest group. When you're riding with people you don't know, I think that makes you more inclined to test it out, there is the element of the unknown, it's a race." Male, Group 5.

"Even experienced riders can learn from watching other riders. There's an enjoyment in watching others. Watching how their bikes work, the suspension as they corner. It's interesting because every bike handles differently." Male, Group 2.

"The larger the disparity in skill [in a group], the safer they will be. People who can't keep up are comfortable being left behind. But if the skill level is close, competition happens and people might ride over their ability." Male Interviewee.

Pillion passengers were also often frequently cited as altering rider behaviour. Usually this was to ride more safely, although on occasion, riders admitted to taking risks they normally wouldn't take because they had a pillion on the back.

"If I've got a guy on the back, I'll go fast, but not as fast as when I'm alone. If it's a girl, then I'll go much slower. I don't want to injure anyone." Male Interviewee.

"I generally stick to the road rules and ride a little more cautiously than if it was just me (though I ride cautious the majority of the time). … But my brother was back in town and he wanted to feel how the bike went, so I did 245kph on this piece of road. I didn't like doing it, he was squealing like a girl, but I did it to scare him because he was talking about getting a bike and he's a psycho. Like even though I knew it was wrong … well I wouldn't say I was doing it exactly for his benefit .. but yeah; and anything could have happened." Male, Group 5.

"If I have a pillion, I'll ride more carefully, rather than actually ride differently. But some people like to show their pillions a good time so ride riskily." Male, Group 7.

"Carrying a pillion slows me down as I'm responsible for their safety. But I'm like that in a car too." Male, Group 3.

Some groups mentioned that rider training and the marketing, style, and maintenance of motorcycles influenced the way people ride.

"Bike shops encourage people to push their limits and see what they and their bike can do." Male, Group 3.

"Racing bikes on TV influence people to buy those types of bikes and try to be like them." Male, Group 2.

"For a fun ride, the older guys on the cruisers just kick back and cruise along and I enjoy that. Sure the riding fast and cornering hard is fun too, but I like to kick back. The type of bike the others have determines how they usually ride." Male, Group 5.

"That Q-Ride video. I sat down and looked at it and I thought 'This guy is so cool, he can do this and he can do that.' I'm sure for a week afterwards I tried to ride like that instructor!" Female, Group 6.

"Even if you watch TV or a video of a motorbike rider doing over 300kph in Switzerland or something, flat out for about 50km, you think – well that is his limit – maybe I can build up to that. So you've got an expectation of what that limit could be. ... I've watched a few stunt movies. Never watch a stunt movie and then go for a ride because you will do something stupid – I've learnt that the hard way. I'd never really thought about some of the stuff they do, but as soon as I saw a few movies, I was out there trying it .. hanging off the side of your bike, scraping your pegs, jumping on top of the petrol tank, stoppies, wheelies, I've been thinking about jumping off the back and holding on to the seat, but I gotta build myself up to that one." Male, Group 5.

"If you've just had your bike in for a tune up, you want to test how it rides. Even if you've just pushed it a few days before; you will push it again to see how it goes. [On the other hand] if you think there is something a bit 'dodge' with your bike and it isn't going too well, you're not going to be pushing it to the same levels as you would if you knew it was in optimal condition." Male, Group 5.

As already discussed in section 3.3.1, some riders stated that protective clothing can make people take more risks, whilst the absence of protective clothing can make riders more careful. Other physical factors such as mood, fatigue, alcohol, road and weather conditions were all mentioned. Familiarity with the environment was also mentioned as a hazard by several groups.

"Familiarity with the route might get people into strife eventually. People know the road, so become complacent and don't perceive the hazards." Male, Group 4.

The image of a motorcyclist appeared important to some riders and affected the way they rode.

"If you have a standard bike, well cool, it's a bike. But if it looks different, and has extras, some of the comments and the way people look at it – everything changes. When you see people looking at your bike or making those comments to you – man, you just want to do more and more. I have ideas coming out of my head!" Male, Group 5.

"Just like when you are sitting at traffic lights and you come away a bit quick and your front wheel comes up and everyone looks at you and you are thinking .. 'next set of traffic lights, do another!' The next thing you are putting your feet out – anything to get attention! I mean, you don't go out of your way to be seen, but you will always notice those people who are looking. Compliments make you feel good, so you do more to get more compliments." Male [different from above], Group 5.

"Older riders see the Ulysses movement and think 'that's a great idea! I owned a bike 30 years ago, I'll go buy one!' They buy the image." Male, Group 2.

"Those Harley riders with open face helmets or little half helmets, fingerless gloves or no gloves, all black ... Some of 'em drag their helmet along the road to scuff it up. Some guys will wear defective helmets rather than mess up their image." Male, Group 1.

3.3.12 Is there a sense of being part of a group when you ride?

The issue of group riding was a major topic of discussion amongst most of the groups interviewed. There were positives and negatives associated with group riding. On the positive side, some riders described group riding as a practical learning experience, as increasing their safety on the road, and as an opportunity for fun and friendship.

On the negative, riding in a group which was not at your level of ability was seen by some as boring or frustrating. Some riders described the "fishing line effect" where everyone follows the one in front and does not think for themselves, causing crashes. The competitiveness within a group environment was mentioned both as a positive and a negative.

The feeling of belonging to a group appeared to be quite universal. Even motorcyclists who rode alone seemed to identify to some extent with other motorcyclists (as opposed to 'ordinary' car drivers).

> *"I don't belong to a group, because I want to live. But if I came off, I'm pretty sure the only person who would stop and help me would be another motorcyclist. ... Because motorcyclists share a similar interest, there is a commonality."* Male, Group 4.

> *"You can be with strangers and still feel part of the group. For example, if you had a BMW and went to Perth, you could still ride with the BMW group there and you'd belong. You'd be in the right spot."* Male, Group 5.

> *"It's a brotherhood. You tip your head, give a nod. Help each other if you break down. Motorcycle police are always friendly, even when they're booking you."* Male, Group 3.

> *"I don't belong to a group, but there is definitely a camaraderie on the road. Sometimes I'll be riding along and a stranger will come up and ride beside me for half and hour or so, then we might pull into a coffee shop or something and have a chat. If I go somewhere, I might look for other bikes and park near them. It is a 'small community' feel. There is definitely a feeling of motorcyclists vs car drivers."* Male Interviewee.

For those who did ride in groups, there was a definite sense of camaraderie although there was evidence of subcultures defined by the type of motorcycle you ride, or the group to which you belong.

> *"It's nice to feel a belonging to the group."* Female, Group 2.

> *"To belong [in a group], something needs to identify you. Either the type of bike, or the way you ride, or your age."* Male, Group 5.

> *"I like riding with a group of personal friends. We all know each other's riding style, and we'll leap frog and some of us will go slow on days when we are not feeling like much of a ride that day and other people take off, but you have that thing with your friends. You are watching out for each other."* Female, Group 6.

> *"If you ride a Buell, another Buell is your best mate, they must be cool because they ride the same bike as you."* Male, Group 3.

"I'm accepted into the BMW club, but I'm not, because I don't own a BMW and nothing else is a 'real' bike. They will let you ride with them, but you will always be an outer because you don't have the bike." Male, Group 5.

"Harley riders don't wave to sports bike riders. I wouldn't stop and help a Harley rider or a BMW if they were broken down, but I would if it was a Jap bike." Male, Group 3.

"A good ride is when everybody gets there and comes back. A bad ride is when we have to pick somebody up and we don't like doing that. We look after our own." Male, Group 2.

3.3.13 Do you feel differently about yourself when you ride your bike?

Few participants said that they felt differently about themselves when they were on their motorcycle; however, being a motorcyclist appeared to be an important part of many riders' identities and they took pride in being a motorcyclist.

"Having a bike is a prestige thing. It is like a person who owns a flash BMW or Rolls Royce or something. It's exceptional – like, how many people own cars? ...[and] you don't get seen in a car, so it's not the same." Male, Group 5.

"I think you can pull chicks easily. It's that mysterious, rough, image." Male, Group 5.

Some of the groups mentioned how a different style of motorcycle, or different clothing can make you feel and act differently.

"Getting on a Harley changes your attitude. Going to the pub as a Harley rider and I become a grumpy bum who won't take shit from anyone. I go as a Honda rider and I'm friendly and have a drink with anyone." Male, Group 1.

"[name of a motorcycle club], *half of them want to be outlaws. They wear the cut off gloves, pudding helmets, chains, tattoos, scarfs with skullcaps on them."* Male, Group 2.

"The style of bike you ride affects everything. Your personality, attitude, behaviour, everything." Male, Group 1.

"When some people are on a bike they feel more masculine, rougher and tougher, like they are owed more respect." Male Interviewee.

3.3.14 Is there anything you see other riders do which you think is just "the wrong thing to do"?

All groups agreed that it was wrong to endanger others. Not endangering others included not drinking and riding, and refraining from reckless riding which may injure or frighten other road users. Most groups mentioned that pillion passengers should wear adequate protective clothing. Whilst some riders disapproved of anyone riding without proper protection, others appeared to feel it was OK to risk your skin, but not that of your pillion. With regard to protective clothing, the 'wrong thing to do' included:

"People riding in stubbies and thongs are idiots. I've seen a guy lose three toes going round a corner in thongs. But you don't have to wear full gear if you are just going down the shops. When you are using the bike as a commuter, rather than as a toy to play on, it is too hot and too much hassle to wear the gear." Male, Group 1.

"Anyone who doesn't use protective clothing, especially for pillion passengers. My taxes go to pay for their scars." Female, Group 6.

"It should be - 'It's my bike, you dress the way I dress, or you don't get on'. If I take my girlfriend and we don't have a second jacket, I give her my jacket and put it on her." Male, Group 5.

"The guy in protective clothes with his girlfriend on the back with nothing. But protective clothing costs a lot of money." Male, Group 7.

"Wheel stands in a tee-shirt and shorts. You should try to protect yourself from getting hurt. You can still have fun, but you should try to lower the risks." Male, Group 1.

"Bike week, where guys are doing monos with almost naked girls on the back, pedestrians just standing around everywhere, and they're doing like 80 kph!" Male, Group 6.

Several groups opposed the 'bad image' that some riders create. According to the participants, the general 'bikie' image of people on motorcycles appears to be changing, but many motorists still think of motorcyclists as 'ratbags'.

"I hate it when motorcyclists do bad things that really annoy the car drivers. Like, I saw one guy, he was lane splitting, and there was a car parked there wanting to change lanes. He was coming up pretty quick in between the cars, and it came out. There is no way the car could have seen him – it was just tilted out enough so the driver could see – and he [the rider] *just stopped and started going off at the driver and he hit the roof of the car and started screaming at him, and I'm thinking it is really his fault, not the car driver's, and he is making a bad image for us."* Male, Group 5.

"Punching a motorist [is wrong]*."* Male, Group 1.

"Stoppies at traffic lights [is wrong]. *It just gets everyone aggro around you."* Male, Group 6.

Most of the groups stated that inappropriate speeding was not acceptable. Inappropriate speeding seemed to relate to speeding in built up areas, or places that they, themselves, would not speed.

"Going quick in places I wouldn't consider going quick. Like, coming out of the city, they will just cane it out. I'm thinking, you have a lane there, you think it is clear, but there are cars on that side, and pedestrians on this side – the number of pedestrians in the city that just step out in front of you is amazing – it's just not safe for the rider or for others." Male, Group 6.

"People doing stupid things at high speed, like passing over a blind crest (because traffic coming the other way is often doing the same thing) and you'll get cleaned up." Male, Group 2.

"Lane splitting through when you're doing 40kph more than the cars are doing." Male, Group 1.

"Going too fast through traffic. You should allow the extra time to get to work rather than racing." Male, Group 3.

Several motorcyclists listed roadcraft and handling errors such as poor positioning, following too close, inattentiveness, not shoulder checking, not checking mirrors, not scanning properly, as 'the wrong thing to do". Not maintaining your bike was seen as the wrong thing to do by participants in at least two groups. Stunt behaviour was also seen by some as the wrong thing to do, particularly wheel stands or stoppies in traffic.

3.3.15 Can you tell us about times you almost lost it? Why did it happen? Could you have done something differently to prevent it? Was it bad luck, your fault or someone else's?

Most riders had at least one story of a time they lost control of their motorcycle. The majority of participants accepted responsibility for their actions, but many focused their stories on the contributing factors such as bad roads. The reasons people gave for losing control were:

- Oil or gravel on the road;
- Other poor road conditions (e.g., potholes, surfacing);
- Unexpected road hazard (e.g., broken down or crashed vehicles, wildlife);
- Pushing the limits;
- Showing off;
- Trying to perform stunts;
- Other traffic didn't see them;
- Other traffic engaging in road rage or other bad behaviour;
- Inattention / lack of concentration;
- Being in a hurry;
- Being under the influence of alcohol;
- New tyres;
- Using tyre shine on the wheels;
- Weather;
- Other riders coming off in front of them; and
- Poor braking control.

3.3.16 Summary

Whilst there was virtually unanimous agreement that a safe rider knows his or her limits, rides within those limits, remains fully aware of themselves, their machine, and their environment and maintains a high degree of focus, there was a surprising amount of variation in responses when

exploring these themes. Most (if not all) the riders participating appeared to consider themselves a 'safe' rider, yet many subsequently recounted what could be defined as extremely high risk riding behaviours.

A minority of riders reported that being 'safe' meant 'not crashing'. However, many riders said that taking a calculated risk, and risking coming off, was an important means of learning one's limits and becoming a 'safer' rider. Strategies suggested by participants to become safer included learning how to come off 'properly' within an off-road/dirt environment, or going to track days where it is a controlled environment so one could learn exactly how fast they can corner before coming off. Participants believed that these types of environments minimised the risk of serious injury.

In general, the majority of motorcyclists interviewed appeared to agree that there was an inherent risk in riding a motorcycle, and that 'coming off' the motorcycle was a fairly normal part of the learning process. The key to 'safe' riding, for most motorcyclists, seems to lie in risk minimisation strategies rather than avoiding risk. The level of risk individual riders are prepared to take differs widely and seemed dependent on person-related factors, their perceived level of skill, their riding experience, as well as their own and their friends past experiences (near misses/crashes etc.), and also the influence of others including family responsibilities and motorcycle riding buddies.

The focus group discussions indicate that most riders try to ride more carefully when carrying a pillion as they feel a responsibility for that person's safety. However, there were notable exceptions. Some of the participants recounted experiences where they felt pressured by the presence of the pillion to go faster or 'show off'. One participant said he felt a responsibility to 'scare' a pillion because he did not want him to take up riding motorcycles. In general, however, endangering others was not approved of by the participants.

Most participants rode with another person or people on some occasions. Other riders were often reported to influence riding behaviour. Sometimes riding with others was reported to be conducive to safety, other times it led to competition and people pushing their abilities as a rider beyond safety. The social dynamics of motorcycling, for many people, extend further than simply enjoying a ride with some others. Carrying a motorcycle helmet is an opportunity to meet other like-minded people, and makes a statement about 'who they are' to other people in the community. Participants spoke of strong friendships formed from a common passion for riding.

3.4 Discussion

The theoretical structure used to guide discussions produced a wealth of information to facilitate the development of both the RRAM. Conceptual Content Analysis was used to examine the interview data to answer the first research question "*What behaviours do riders identify as being directly related to safe and risky riding?*" Although the analysis was performed solely on the focus group data, the six themes identified as behaviours related to safe and risky riding were not inconsistent with issues which emerged from the literature review. The six main behavioural themes identified were:

- Handling skills;
- Concentration and focus;
- Road rules;
- Impairment;
- Pushing your limits; and

- Stunts / extreme speed.

In addition, three psychosocial themes were identified:

- Attitudinal and control factors;
- Normative influences; and
- Person-related factors, particularly the intrinsic rewards associated with risk-taking.

These themes are discussed in more detail below.

3.4.1 Dimensions of rider behaviour

The following behavioural themes emerged from the focus group analysis.

Handling skills: There was general agreement that a certain level of expertise in handling a motorcycle was essential to safe riding. Crash experiences that were recounted often involved errors such as running wide on a corner.

Concentration and focus: Staying aware and focussed, and maintaining concentration, were considered essential to safe riding by the participants. A lack of concentration, or not paying full attention to the road, was often mentioned as a contributing factor to past crashes.

Impairment: There was general agreement that anything that detracts from a rider's normal levels of concentration and alertness is unsafe. Most participants considered it 'stupid' to drink and ride; however, many admitted that they would ride fatigued. Some suggested that fatigue was not an impairment as the adrenaline rush would ensure they stay awake and alert. Mood was also mentioned by many participants (being too hyped or stressed) as a possible contributor to crashes. Some riders reported crashing after drink riding (albeit some time ago) or because they were in a hyped-up mood.

Road rules: Most respondents mentioned breaking (or bending) the road rules. Some said that it was necessary to break the law to maximise their safety. Others said that you should follow the road rules as much as possible. Most participants seemed to break the rules of the road occasionally (which could also be argued to be true of most car drivers), but some riders appeared to have a greater willingness to do so than others. Whilst many riders stated that riding at excessive speeds was 'safe' provided it was done at the right time and place, several riders interviewed had crashed because they were going too fast to deal with an unexpected event.

Pushing your limits: All participants were asked about pushing their limits. Almost everyone appeared to think of themself as a 'safe' rider and, whilst all agreed the risk of coming off your bike is increased when you push your limits, the benefit (increasing your skill and the sheer fun of it) was considered worth the risk. Most riders appeared to engage in this behaviour as a normal part of their riding; however, where, when, how and how often a person 'pushed their limits' varied. This variation may be a key factor in identifying higher risk riders. Several participants reported that they were pushing their limits when they crashed.

Stunts / extreme speeds: Performing stunts and riding at extreme speeds were behaviours raised by each focus group. Some riders admitted that they enjoyed performing stunts such as wheel stands and would do these on public roads, although more did not engage in these behaviours and felt that performing stunts in public areas was the wrong thing to do. Many of the motorcyclists interviewed stated that they exceeded the speed limit, particularly on country roads. In addition, some frequently rode at extreme speeds (in excess of 200kph). Riders that engaged in stunt behaviour also reported coming off as a result. It takes practice to perfect the stunts and this appears to involve crashing the motorcycle from time to time.

3.4.2 Psychosocial influences on riding behaviour

This study also served to initiate investigation into research question 2, "*What are the psychosocial factors that influence rider intentions to perform behaviours related to safe and risky riding?*" and research question 3, "*What are the psychosocial factors that influence both 'safer' and 'risky' riding as defined by self-reported behaviour, crash involvement and traffic offences?*". Three broad psychosocial themes relating to safe and risky riding that emerged from the focus group analysis are discussed below.

3.4.2.1 Attitudinal and control factors

The riders that recounted their own crash experiences tended to fall into two general categories. First, there were riders that made every effort to be 'safe'. These riders often crashed due to some kind of handling, concentration, or hazard perception error, or were hit by other traffic (for example, one participant reported being run over by another vehicle whilst parked at traffic lights). This type of rider did not seem to hold a positive attitude towards risky behaviours. Instead, they tended to ride as safely as possible most of the time, but may have felt they had less control over the circumstances of their crashes. Whilst it is impossible to determine if these riders actually had fewer crashes than those who hold positive attitudes towards high risk behaviours, from the discussions, it appeared that the crashes they recounted were usually less serious (except in the cases where they were hit by other traffic).

The second category of riders appeared to hold positive attitudes to riskier behaviours. These riders enjoyed riding at extreme speeds, appeared to break the road rules frequently and think it was OK to do so, and often enjoyed a competitive social riding environment. The discussions indicated that these riders were (or at least, perceived themselves to be) very adept at handling a motorcycle as they often expressed a high confidence in their riding abilities. The crashes that were recounted by this type of rider often resulted from 'pushing the limits', but also frequently included crashes resulting from road conditions (gravel, oil, or other debris on the road; or road surfacing issues). Many of the crashes described by these riders appeared to be directly related to their higher risk riding style.

3.4.2.2 Normative influences on rider behaviour

This study also gave rise to some information which addresses research question 4: *"What is the impact of other riders on intentions and behaviour in a group riding situation?"* Several social influences emerged as important to riders and are listed below.

Family and significant others: Most of the participants described some feeling of responsibility to look after themselves on their motorcycle to prevent their family and friends from having to cope with the anguish and burden associated with their involvement in a serious crash. These feelings appeared to be most salient amongst police officers and riders who had experienced the death of a close friend or relative in a road crash (or been in a serious crash themselves). However, for most of the participants, it seemed that this concern for significant others had only a sporadic affect on their on-road behaviour. Riding that could be interpreted as risky appeared to often be accompanied by an absence of thought about anything other than the motorcycle and the experience at that moment.

Employment considerations: Employment considerations were most salient amongst the police and rider trainer groups; however, many other participants reported that they were careful not to go too far over the speed limit out of a fear they may lose their licence (which would have a detrimental effect on their ability to work). Almost all the rider trainers who participated seemed to feel they should model good behaviour, at least while accompanying learner riders; and for a few, the responsibility of being a role-model appeared to continue to reinforce safer on-road riding

behaviour outside of working hours. The police appeared most concerned with the safety of themselves and the public, rather than acting as role-models for good riding behaviour. The police are in a unique position as their work actually requires them to sometimes take risks on their motorcycles in order to apprehend offenders or to reach emergency situations.

Other riders: All groups and the interviewee mentioned the influence of other riders. No obvious pattern emerged from the discussions about the type of people a person rode with. A desire to ride appeared sufficient, in many cases, to form a 'group' for that day's ride. People reported riding with family members, friends, acquaintances and total strangers. The egalitarian nature of motorcycling was mentioned by several participants, who enjoyed the fact that they could go anywhere and find people to ride with based on this common interest. Riding skill, age, gender, employment, social status etc. were not generally regarded as important (although some organised groups require members to be a certain age or ride a certain motorcycle brand).

Generally those people, who rode in groups, or with at least one other person, did so because they enjoyed the style of ride that was typical of that group. Larger clubs may go on a group ride, but faster riders tend to ride together at the front, with slower riders towards the rear. Riders reported crashing in group situations. Often, an error made by another group member contributed to the crash. Most of the riders recounted a competitive element to group riding; however, few mentioned crashes due to this. Another issue related to group riding was that sometimes people stop thinking for themselves and simply 'follow the leader', even if this is potentially unsafe. Several participants recounted stories of times they have either directly experienced, or witnessed, riders who have 'switched off', and subsequently crashed, because they were no longer taking full responsibility for their ride, but relying on the actions of other group members for their cues to potential danger. Finally, many riders described the positive benefits of group riding as a tool for learning, as a buddy-system to keep you safe, and as an important social outlet.

3.4.2.3 Person-related factors

All groups and the interviewee mentioned factors that could be termed 'person-related'. Terms such as 'ego', 'vanity', 'aggression', and 'thrill seeking' were all used to describe the motivations underpinning risky behaviours. In the discussions, there were definitely some people who appeared driven to push their limits harder than others, to take more risks, and who seemed more willing to accept crashing as a consequence of their actions. Whilst it is possible that many motorcyclists may be 'sensation seekers', it would be interesting to see if this type of motorcyclist is a significantly higher sensation seeker (in terms of their score on the adapted driver thrill seeking scale) than others, and if other variables, such as a tendency to engage in aggressive on-road behaviour, are predictive of risky riding intentions or crashes.

Age and gender did not emerge in this study as strong indicators of behaviours that seemed risky as some riders in every group seemed to engage in what could be termed 'risky' riding behaviour (e.g., excessive speed, riding up the inside or between traffic). The exception to this was that younger males appeared most willing to engage in stunt behaviour. Although participants were not asked any questions about their socio-economic status, as mentioned previously, comments from many riders indicated that motorcycling is very egalitarian. People might be judged on the style of bike they ride (e.g., Harley vs. Japanese sports bike); however, what they do for a living or how much money they have is not important. What is important, is a passion for motorcycling.

The type of motorcycle a person rides may influence risk taking behaviour. Several groups and the interviewee mentioned how sports bikes have a different 'feel' to a cruiser (for example). Sports style motorcycles place the rider in a position (low and leaning forward) which appears to encourage faster riding, whereas many of the enduro (or off road) type of motorcycles are used for stunts.

The purpose of a journey may also influence risk taking behaviour. Feelings of aggression appeared to be most prevalent in traffic situations and some participants reported that they sometimes took more risks in this mood to get away from traffic or out of frustration. Several people who commuted for work purposes described these feelings. The participants who rode mainly for pleasure on country roads often rode with others. Common risky behaviour included excessive speed, competing behaviour which may push a person to ride past their ability to handle the motorcycle, 'following' group behaviour (i.e., an individual might not think for themselves, but 'follow the leader' even if this is unsafe), and the distraction of group riding meaning that sometimes hazards are not perceived.

3.5 Chapter Summary

The theoretical structure used to guide the focus group discussions (see Table 5) suggested that of the standard TPB variables (attitude, subjective norm, perceived behavioural control), attitude and PBC are likely to be much stronger predictors than the subjective norm. Attitudes about safe and unsafe riding were easily elicited and the participants were able to list advantages and disadvantages of riding safely and unsafely. Attitudes towards the police and road rules were also readily elicited.

Whilst the subjective norm (i.e., people who are important to me) may be predictive of safer riding, it is possible that a specific subjective norm (a referent group of 'people I ride with') may be more useful to predict risky riding. Participants indicated that often it is the heat of the moment, and the competition, which lead people to push their limits beyond their capabilities. When asked about who the participants discuss their riding with, the most common response was 'other riders'. It seemed that the opinions of non-riders were not seen as particularly relevant and discussions (about riding) with family members who were not supportive of a person's riding were simply avoided. Although it appeared that there is some influence of family, friends and work considerations on the riding behaviour of some individuals, it seemed that these considerations were not always salient, particularly in a group riding situation. It was not uncommon for participants to ride with family members, partners, work colleagues, or other significant friends so there may be some overlap of the standard subjective norm and a specific subjective norm.

Responses to the questions designed around perceived behavioural control appeared quite salient. Some riders admitted they would find it difficult to ride safely at all times, and some have little interest in riding safely as it would be 'too boring'. Almost every participant talked of the thrill of riding and for many, some of the thrill stems from pushing their limits. The nature of 'pushing one's limits' means that there is an increased risk of crashing the motorcycle (although many riders reported pushing their limits in locations where, if they do come off the motorcycle, they will be less likely to be seriously injured). There were many responses to the question around what affects the way a person rides including the group they are riding with, pillion passengers, protective clothing, the notion of image, rider training, police presence, mood, physical impairment, road environment and weather conditions. The breadth of response to this set of questions indicates that perceived behavioural control may be a good predictor of risky riding intentions and behaviour.

Group identity appeared to be a real phenomenon within the groups interviewed, but the self identity question was not as fruitful. However, there were definitely some participants for whom being a motorcyclist was very important. Some of these riders had strong group riding ties as well, although not all.

The moral norm question bought to light that riders consider endangering others is the wrong thing to do and that a rider should try to minimise their own risk. Promoting a good image to other road users also seemed a concern. The concept of moral norm may be best explored by examining whether the self-reported behaviours that riders engage in include behaviours that participants considered 'the wrong thing to do', rather than as an independent variable within a TPB construct.

The causal attribution question provided good information on the actual circumstances leading to crashes experienced by the participants and will serve to assist in the development of behavioural items that appear associated with crashes.

In conclusion, this study primarily addressed the first research question. Six behavioural areas were identified which are important to understanding safe and risky riding. These were: good bike handling skills, maintaining concentration and awareness, bending the road rules, not riding whilst impaired, pushing the limits, and performing stunts and riding at extreme speeds. These themes appear to be reasonably consistent with the literature relating to motorcycle crashes. Australian (Haworth, Smith et al., 1997), European (Association of European Motorcycle Manufacturers, 2004), and American (Hurt et al., 1981) studies into motorcycle crashes have reported that loss of control, lack of attention, disobeying road rules, impairment (e.g. under the influence of alcohol), and speeding increases crash risk.

Some insight into the other research questions was also obtained. Themes relating to the psychosocial influences on rider behaviour emerged from the discussions, as well as specific information on group riding. Many of the comments which described the experience of riding, the social context of riding, and the reasons motorcyclists take risks, are consistent with comments provided in an earlier Australian study into motorcyclist attitudes and behaviours (Krige, 1995a). The similarity of comments suggests that the experience of riding a motorcycle evokes many common feelings and behaviours amongst riders.

The results of this study served to inform the development of the RRAM in two important ways. First, while most of the theoretical constructs explored in this study attracted a wide range of views and opinions, there was little variation in responses to the moral norm question. Therefore, the theoretical model to be used in Study 2 was further refined to include: the standard TPB, specific referent group subjective norm, group norm, measures of self identity, sensation seeking and a propensity for aggression. These constructs appear to be a promising framework to investigate research questions 2 and 3 in greater detail. Although the self identity question did not evoke many comments from participants, the image of being a motorcycle rider did appear important to many of them. It was, therefore, decided that this construct would benefit from being developed into two concepts: self identity as a safe rider and self identity as a risky rider. The personal norm variables (i.e. anticipated regret and moral norm) will be excluded from the theoretically based analysis.

Second, information gathered from this research, including the analysis of the moral norm and causal attribution questions, was used to construct questionnaire items relating to specific behaviours that could be considered under the six broad behavioural areas of interest. Other topics which motorcyclists considered may be related to safer or risky riding were also included within the list of behavioural items. This process is discussed in more detail within the next chapter.

4 A QUANTITATIVE EXPLORATION OF RIDER INTENTIONS AND BEHAVIOUR

4.1 Rationale for the quantitative study

The quantitative questionnaire used in this study was designed to investigate both the psychosocial influences on rider intentions and behaviour, and their relationship to crashes and offences. The study questionnaire consisted of three major components: a set of questions to assess basic socio-demographic information; a collection of scales and measures to assess the psychosocial influences on intentions; and a set of measures of self-reported on-road riding behaviour. A copy of the full questionnaire is presented in Appendix E.

As the Theory of Planned Behaviour (Ajzen, 1985, 1988, 1991) is based on the assumption that behavioural intentions and perceived behavioural control (PBC) may both independently predict behaviour, this study was designed to, firstly, assess which psychosocial factors best predict rider intentions. Secondly, an analysis was conducted to assess whether intentions and PBC independently predicted rider behaviour.

4.2 Research hypotheses

The focus of this study was to answer research questions 2, *"What are the psychosocial factors that influence rider intentions and behaviour";* and 3, *"What is the impact of other riders on intentions and behaviour in a group riding situation?"* In order to explore these questions, the following ten hypotheses were tested.

H_1 *The TPB will predict intentions to perform the six rider behaviours of interest.*

As past studies have found the TPB constructs to be relatively effective in predicting intentions and behaviour in the road safety context, it is hypothesised that the TPB will significantly predict intentions in this study (Evans & Norman, 1998; Gordon & Hunt, 1998; Lajunen & Räsänen, 2004; Parker et al., 1995; Parker et al., 1992; Parker et al., 1996; Quine et al., 1998, 2001; Sheehan et al., 1996).

H_2 *Extending the TPB to include a specific subjective norm, group norm, and self identification variables will explain more variance in intentions to perform the six behaviours of interest than the standard TPB model.*

The poor performance of the subjective norm in many TPB studies has led researchers to seek alternative ways of exploring normative influences (Armitage & Conner, 2001a). It has been suggested that the subjective norm in the traditional format of "people who are important to me" may not adequately capture the range of social influences that people experience (Terry & Hogg, 1996). Several TPB studies have successfully introduced specific referent groups, group norms, and/or self identification to enhance the TPB (e.g., Johnston & White, 2003, 2004; McMillan & Conner, 2003; Parker et al., 1992). This hypothesis is also based on the focus group discussions which indicated that who a person rides with will often affect their behaviour. According to participants, sometimes this influence is to promote safer riding practices, and at other times it encourages risk taking behaviour. Therefore, the inclusion of a specific subjective norm and a group norm which references "the people I ride with", along with items which reflect whether an individual perceives themselves as a safe or risky rider are hypothesised to better capture the range

of normative influences on rider intentions and will result in a stronger predictive model than the standard TPB.

H_3 *The specific subjective norm will better predict intentions than the standard subjective norm variable.*

This hypothesis focuses on the specific subjective norm rather than the range of normative factors examined by H_2. The subjective norm component of other TPB studies that have used a specific referent group or groups instead of a more global "people who are important to me" appear to have attained better results (e.g., Parker et al., 1992). These studies have also indicated that different sources of social influence (e.g., work colleagues, family, friends) exert different amounts of pressure on a given behaviour. Whichever referent group is most salient at the time will most likely exert the most amount of influence on behaviour (Cialdini et al., 1990). The focus group study indicated that, whilst there were several potential sources of influence (work, family, other riders, other traffic etc.), when riding in a group, these other riders were generally the most salient referent group. Therefore, it is hypothesised that a specific subjective norm of "the people I ride with" will account for more variance in intentions than the standard subjective norm.

H_4 *The perceived normative behaviour of the referent group will significantly predict intentions.*

The discussions conducted in Study 1 indicated that people tend to ride with other riders who have a similar riding style. Even in disparate groups, faster riders tended to group together at the front, with slower riders bringing up the rear. Some riders spoke of feeling frustrated when riding with others who do not share their riding style. A rider's actual level of riding ability did not appear as important as a desire for a shared riding style. Participants spoke of learning from other riders (or taking other riders under their wing and teaching them how to ride like them). As the choice of group appears to reflect a person's preferred riding style, it seems likely that the normative behaviour of the group will either already match the individual prior to joining the group, or the individual will strive to conform to the normative behaviour of the group once they have joined. Therefore, the perceived behaviour of the referent group (i.e. *the people I ride with*) should predict an individual's riding intentions.

H_5 *Self identification as a safe rider will be a significant predictor of the three 'safer' riding intentions.*

Self identification as a 'safe pedestrian' was found to predict safer road-crossing intentions in a TPB-based study by Evans and Norman (1998). Therefore, it is hypothesised that participants who identify as safe riders will report safer riding intentions. Based on the findings of Study 1, three behaviours were operationalised to reflect safer riding (*handling my motorcycle skilfully*, *always be 100% aware of the traffic and surrounding road environment*, and *refuse to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in any way*). It is hypothesised that self identification as a safe rider will predict these three safer riding intentions.

H_6 *Self identification as a risky rider will be a significant predictor of the three 'riskier' riding intentions.*

Several studies have shown that self identification may independently influence intentions (e.g., Evans & Norman, 1998; Sparks & Shepherd, 1992). The conceptual content analysis of Study 1 resulted in three behaviours being operationalised to reflect more risky riding (*bend road rules to get through traffic*, *push my limits*, and *perform stunts or ride at extreme speeds*). Therefore, self identification as a rider who takes risks should predict these more risky riding intentions.

H_7 *Sensation seeking scores will significantly predict the three 'riskier' riding intentions and related behaviours, over and above other psychosocial influences.*

Many studies of risky driving behaviours have found an association between sensation seeking and risky driving (Arnett et al., 1997; McMillen et al., 1989; Palamara & Stevenson, 2003; Stacy et al., 1991; Tay et al., 2003; Whissell & Bigelow, 2003). It has been suggested that sensation seeking may account for as much as 10-15% of the variance in risky driving (Jonah, 1997a). It is, therefore, hypothesised that higher sensation seeking tendencies will be positively associated with higher risk riding activities even after the other psychosocial variables (TPB, specific subjective norm, group norm, self identity) have been accounted for, and hence, will predict the three 'riskier' riding intentions and related behaviours.

H_8 *A propensity to engage in aggressive riding behaviour will significantly predict the three 'riskier' riding intentions and related behaviours, over and above the influence of other psychosocial variables.*

High driver aggression has been linked to crash involvement and risky driving behaviours by Wieczorek (1995) and Matthews, Dorn, and Glendon (1991). It is hypothesised that instances of past on-road aggression will be indicative of an aggressive rider and, therefore, significantly predict the three 'riskier' riding intentions and related behaviours.

H_9 *Intentions and PBC relating to the six rider behaviours examined in this study will significantly predict self-reported behaviour.*

As already noted, a central tenet of the TPB is that behavioural intentions and perceived behavioural control (PBC) may both independently predict behaviour. As such, this hypothesis is designed to assess the degree to which the measures of intentions and PBC operationalised in this study are capable of predicting the various behaviours of interest.

H_{10} *A positive association will be found between the intentions and behaviour of the participants and their self-reported crash involvement.*

H_{11} *A positive association will be found between the intentions and behaviour of the participants and their self-reported traffic offence involvement.*

These two hypotheses are based on the assumption that the intentions and, in turn, the behaviour of the participants will directly influence their likelihood of breaking the road rules (and hence being detected of a traffic offence) and being involved in a crash.

4.3 Method

4.3.1 Participants

The participants for this study were recruited primarily from two sources: a public 'Rider Survivor' event, and a mail-out using the database of a private motorcycle rider training company[2]. Some additional questionnaires were distributed to motorcyclists who expressed interest, having heard about the research from focus group participants or via word-of-mouth.

A total of 738 questionnaires were distributed; 512 (69%) were given to males and 226 (31%) to females. Of these questionnaires:

- 56 were distributed at the rider survivor event;

2 In keeping with privacy legislation and the university ethical guidelines, the questionnaires were mailed out by the training company so that no names or contact details from the database were seen by the researcher.

- 649 were mailed to a random sample of motorcyclists who had attended rider training (464 who had completed Q-Ride training, and 185 who had not, but had completed some form of advanced rider training); and
- 33 were mailed to people who approached CARRS-Q expressing an interest in receiving a questionnaire.

Information relating to those participants who responded to the questionnaire is provided in section 4.4.1.

4.3.2 Study design

Study 2 was designed as a cross-sectional survey. The content of the survey was based primarily on the results of the conceptual content analysis reported in Study 1, but was also informed by the literature. The independent and dependent variables are discussed below.

4.3.2.1 Independent variables

As discussed in the previous chapters, a theoretical approach based on the TPB, augmented with additional theoretical constructs, was used as the framework for this study. The independent variables that were operationalised using this framework were:

- attitude;
- subjective norm (SN);
- perceived behavioural control (PBC);
- specific subjective norm (SSN);
- group norm (GN);
- self identification as a safe rider;
- self identification as a risky rider;
- sensation seeking (SS);
- a propensity for aggression; and
- behavioural intention (primarily a dependent variable; however, behavioural intention was used as an independent variable to test actual behaviour and also for the correlation between intentions and crash involvement).

In addition, socio-demographic variables which are commonly found to influence road user behaviour were also incorporated into the final analyses:

- age;
- gender; and
- average number of hours spent riding each week (i.e., a measure of exposure).

4.3.2.2 Dependent variables

There were 14 dependent variables used in this study comprising six behavioural intentions, six behaviour scales, as well as crash and offence history.

The behavioural intentions were formulated around the six behaviours which emerged from the focus group discussions. These were operationalised to reflect three 'safer' intentions and three volitional risk-taking ('riskier') intentions.[3] The six intentions, as they appeared in the questionnaire, were:

Safer

- handle my motorcycle skilfully;
- always be 100% aware of the traffic and surrounding road environment[4];
- refuse to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in any way[5];

Riskier

- bend road rules to get through traffic;
- push my limits; and
- perform stunts and/or ride at extreme speeds.

A correlation analysis [n = 225] was undertaken to explore the relationship between intentions. As shown in Table 6, the correlations tended to confirm the construct validity of grouping these variables into the two categories of 'safer' and 'riskier'. Intentions to *handle my motorcycle skilfully* was positively correlated with intentions to *maintain 100% awareness* [*r* = .62] and negatively correlated with *bend road rules to get through traffic* [*r* = -.17], *push my limits* [*r* = -.23], *perform stunts and/or ride at extreme speeds* [r = -.11], as expected. Similarly, intentions to *bend road rules to get through traffic* was positively correlated with intentions to *push my limits* [*r* = .51] and *perform stunts and/or ride at extreme speeds* [r = .44]. However, the intention to refuse to ride impaired did not correlate with any other intention.

Table 6. Bivariate correlations between intentions

	Intention					
	Handling	100% aware	Not if impaired	Bending rules	Pushing limits	Stunts or speed
Handling	-	.62****	.05	-.17*	-.23**	-.11
100% aware		-	.01	-.22**	-.28***	-.21**
Not if impaired			-	.09	.02	-.02

3 In addition to these six intentions, an overarching intention of "riding as safely as possible" was included in the questionnaire. However, the results for this intention were largely consistent with those for the three 'safer' intentions and, hence, are not presented in this report.

4 Abbreviated to "maintain 100% awareness" for the remainder of this document.

5 Abbreviated to "refuse to ride impaired" for the remainder of this document.

Bending rules	-	.51***	-.44***
Pushing limits		-	.72***
Stunts or speed			-

*** $p < .001$; ** $p < .01$; * $p < .05$ (2-tailed)

The second stage of this study assessed the relationship between the independent variables (including intention) and the six behaviours of interest. The six behaviours were operationalised through the use of self-reported behaviour scales, described in section 4.3.3.3 (see Appendix A for a list of the scales).[6] To facilitate the calculation of a composite behaviour scale, the items were all worded such that a higher score reflected a less safe behaviour. To maintain the distinction between the 'safer' and 'riskier' behaviours, the handling and awareness related behaviours were operationalised as 'errors', rather than as deliberate acts.

A correlation analysis [$n = 228$] was undertaken to explore the relationship between the self-reported behaviour scales, as well as the composite scale. As shown in Table 7, significant correlations were found among all the behaviour scales. In particular, strong relationships were found between the scales measuring *bending the road rules*, *pushing limits* and *performing stunts and/or ride at extreme speeds*, with all the inter-correlations exceeding .60. This tends to confirm the links between these more volitional risk-taking behaviours, which was also evident among the corresponding intentions. While a strong association was also found between the *handling errors* and *awareness errors* scales ($r = .76$, $p < .001$), these variables correlated less strongly with the three volitional risk-taking variables (i.e. all correlations were below .50). While the behaviour scale relating to *riding while impaired* was significantly correlated with all the other scales, the only particularly strong relationship was with *pushing the limits* ($r = .61$, $p < .001$).

Table 7. Bivariate correlations between self-reported behaviours

	Self-reported behaviours						
	Handling errors	Awareness errors	Ride impaired	Bend road rules	Push limits	Stunts or speed	Total behaviours
Handling errors	-	.76***	.48***	.40***	.46***	.41***	.68***
Awareness errors		-	.51***	.37***	.47***	.42***	.69***
Ride impaired			-	.52***	.61***	.55***	.75***

6 The fact that the self-reported behaviour data was collected at the same time as the intentions raises causal ordering issues that need to be kept in mind when testing the TPB (see section 4.4.3).

Bend road rules		-	.61***	.72***	.83***
Push limits			-	.83***	.85***
Stunts or speed				-	.87***
Total behaviours					-

*** $p < .001$; ** $p < .01$; * $p < .05$ (2-tailed)

In addition, the self-reported crash and offence history of the participants over the past two years were examined as dependent variables. A crash was defined as an incident which resulted in an injury to the rider or someone else which required medical attention (i.e., a doctor or the hospital) or where there was serious damage to the motorcycle or another vehicle.

4.3.3 Materials

The questionnaire was designed to collect three major types of information:

- socio-demographic;
- psychosocial influences on riding intentions; and
- self-reported on-road riding behaviour.

In addition, there was one page of general information about the project, including contact details for the researchers and UHREC, and one page of instructions. All questionnaires were supplied with a reply-paid envelope addressed to the research team. A copy of the questionnaire is provided as Appendix E.

4.3.3.1 Socio-demographic information

A range of socio-demographic information was collected including age, gender, marital status, whether they had children, licence status, riding experience, riding exposure, past rider training, type of motorcycle owned, and whether they had any permanent injuries or disabilities from past motorcycle crashes.

4.3.3.2 Psychosocial influences on riding intentions

The section of the questionnaire dealing with the psychosocial influences on riding intentions required the operationalisation of the theoretical constructs discussed earlier and included several different scales. Below, each of the items used in the analysis is presented under a heading corresponding to the relevant theoretical framework.

Theory of planned behaviour

The TPB constructs were measured using 7-point Likert scales, since these have been shown to have better reliability than a five or nine point scales (Diefenbach, Weinstein & O'Reilly, 1993; Osgood, Suci & Tannenbaum, 1957). The following format was utilised, with <*the behaviour*> corresponding to each of seven behavioural items listed in section 4.3.2.2.

- Attitude: <*The behaviour*> is important to me.
- SN: Most people who are important to me would want me to <*do the behaviour*>.
- PBC: Whether or not I <*do the behaviour*> is completely within my control .
- Intention: It is likely that I will <*do the behaviour*>.

An additional subjective norm construct, measuring the influence of a salient referent group, was measured using the following format:

SSN: The people I ride with would want me to <*do the behaviour* >.

Identity theory

Four questions were included to investigate whether a person identified themselves as a safe or risky rider:

- I am the sort of rider who rides safely at every opportunity.
- I am the sort of rider who takes risks at every opportunity.
- Being a rider who takes risks is an important part of who I am.
- Being a safe rider is an important part of who I am.

Self identification as a safe rider was operationalised using a composite of the two items: "I am the sort of rider who rides safely at every opportunity" and "Being a safe rider is an important part of who I am". Self identification as a risk-taking rider was similarly operationalised, using the items: "I am the sort of rider who takes risks at every opportunity" and "Being a rider who takes risks is an important part of who I am". Respondents indicated how strongly they agreed or disagreed with these statements on a Likert scale ranging from 1 to 7. In general, a scale should have a minimum Cronbach's alpha of .7 to be considered a satisfactory measure. As the Cronbach's alpha for the safe

riding identity composite item was .73 and the Cronbach's alpha for the more risky riding identity was .69,[7] both scales were considered to be moderately reliable.

Social identity theory

The perceived normative behaviour of the referent group was included for each of the seven targeted behaviours, and measured using a 7-point Likert scale, using the format:

GN: The people I ride with would <*do the behaviour*>.

Sensation seeking theory and aggression

Sensation seeking was measured using an adaptation of an 8-item driver thrill seeking scale used by Stradling et al. (2004, p. 180). Most of the questions were adapted for riding (e.g., *I would enjoy riding a motorcycle on a road with no speed limit*), although one question was omitted and replaced with a general risky riding question. The items used in this study are detailed in Appendix A. Although Zuckerman's SSS (1994) has been widely used and validated, a previous study conducted by CARRS-Q found that the thrill and adventure scale appeared to lack face validity amongst many Queensland motorcyclists (Watson et al., 2003). The main advantages to the adapted Stradling et al. (2004) scale, as compared to the Zuckerman (1994) thrill and adventure scale, is that it is shorter (8 items) and it examines only road user behaviour, rather than generalised thrill seeking, which provides good face validity. The original scale was found to have high reliability according to Stradling et al. [standardised item alpha of .91]. Once adapted for motorcycle riders, the scale used in this study still possessed good reliability [standardised item alpha = .88].

A measure of propensity for on-road aggression was compiled by creating a scale from the 6 items listed in Appendix A [α = .72] (e.g., how often have you felt angry and aggressive towards another road user). These items evolved from comments in Study 1 where participants described reactions of frustration and anger with other road users who had either deliberately, or inadvertently, endangered them. Three items from the Driver Behaviour Questionnaire (Reason, Manstead, Stradling, Baxter & Campbell, 1990) appeared to capture some of these reactions, so were adapted for this purpose.

4.3.3.3 Psychosocial influences on riding behaviour

The 68 items that were selected to assess self-reported behaviour (Q4 and Q6, see Appendix E) were based on: the findings of the focus groups; previous motorcycle safety research conducted by the research team (e.g. Watson et al., 2003); other recent motorcycle safety research (e.g. Elliott et al., 2003); and research utilising the Driver Behaviour Questionnaire (DBQ) (Reason et al., 1990). From these items, six scales (consisting of 50 items) were formed to assess the specific behaviours of interest that emerged from the focus group study. Whilst some items could potentially have been applicable to several behaviours (e.g., "*Almost lost control whilst cornering*" could potentially be indicative of a handling error or to pushing the limits); a decision was made to include each question in only one scale. The reliability of these scales was generally good, with only one having a Cronbach's Alpha below .7 (see Appendix A for a list of the items in each scale and the relevant Cronbach's Alpha). Whilst some general questions had been included in the questionnaire to assess overall safety behaviour (e.g., checked your tyres for wear, pressure, or nails etc. before you rode), in practice these did not form a reliable scale. (This outcome is not surprising as overall safety is not a specific behaviour *per se*).

7 A single scale, combining the two safe self identification items and the two (reversed) risky self-identification items, resulted in an even lower alpha [α = .62], suggesting that these items may not be polar opposites. Therefore, this single scale was not used.

4.3.4 Procedure

Once ethical clearance was provided by QUT's University Human Research Ethics Committee (QUT Ref No 3444H), a preliminary version of the study questionnaire was piloted on 39 riders, including some of the later focus group participants and riders recruited from a public motorcycle event. The design of this questionnaire was based on motorcycle questionnaires that have been used in the literature (in particular, Elliott et al., 2003) and Watson et al., 2003) and comments that had arisen from the focus group discussions conducted to date. Rider feedback on the questionnaire was provided either on the spot (verbally) or written on the questionnaire by those who chose to take the questionnaire home and return it via mail. This preliminary questionnaire was then coded and entered into SPSS to determine its internal consistency and validity. As substantive adjustments were made to the questionnaire on the basis of this feedback and data testing, the data collected in this process were not used for any further analysis and do not contribute to the data reported in this document.

A second version of the study questionnaire was piloted on six motorcycle riders and some minor adjustments were made on the basis of the feedback received. A refined (third) version of the questionnaire was then distributed to 738 people, either face to face or by mail, as described in section 4.3.1. All questionnaires were supplied with an addressed, reply-paid envelope. As no identifying information was collected, it was impossible to send a 'reminder' letter. Therefore, the response rate was reliant on only one contact. However, the benefits of confidentiality were considered to outweigh the disadvantages of a single contact data collection methodology.

4.3.5 Statistical analyses

Once questionnaires were received, the data were entered into an SPSS dataset. A series of hierarchical regression analyses were first conducted to test how well the TPB, and the other psychosocial, normative, person-related, and demographic factors of interest, predicted the six rider intentions. A second series of regression analyses were then performed to assess how well intentions, and the other variables, predicted each of the six behaviours of interest, derived from the self-reported behaviour items.

In order to perform parametric analyses, the Likert scale data was treated as interval in nature. The sample size for all the regression analyses exceeded the recommendation that $N \geq 50 + 8m$ (where m is the number of IVs) to ensure the power met the requirements for detecting a medium effect-size with a significance level of .05 and 80% power (i.e., $\beta = .20$) (Tabachnick & Fidell, 2001).

Correlations were also examined to assess whether there were significant associations between crash and offence history and each of the independent variables listed in section 4.3.2.1. A non-parametric statistic, Spearman's rank order correlation, was utilised as the assumptions for a point-biserial correlation were not met due to uneven cell sizes.

4.4 Results

4.4.1 Profile of respondents

A total of 233 questionnaires were returned, representing a response rate of 32%. The data were cleaned and of these, only four were deemed to be invalid and, subsequently omitted from all analyses. The demographic characteristics of the remaining 229, which were used in the final analyses, are outlined in Table 8. The mean age of the sample was 44.6 years, with male respondents ranging from 19 to 76 years of age and females from 21 to 62 years of age. Most of the respondents were married with at least one child.

Table 8. Demographic characteristics of sample

Demographic Characteristics	No.	% sample	Mean	SD
Male age	152	66	45.6	11.2
Female age	75	33	42.3	10.4
Married	169	74		
Single	36	16		
Separated, Divorced, or Widowed	22	10		
No children	78	34		
Child or children under 16yrs	46	20		
Child or children over 16 yrs	90	40		
Children both over and under 16yrs	12	5		

NB. Percentages do not always add up to 100% due to missing data or rounding

Most respondents held an open motorcycle licence as shown in Table 9. Almost 100% of the participants also held a current, open, car licence, as only 1% held a provisional car licence. In addition, a reasonably large proportion of respondents (29%) held a current truck or bus licence.

Most riders were experienced [M = 11.3 years] although female riders [M = 5.9 years] were significantly less experienced than males [M = 13.9 years; $t(208) = 6.31$, $p < .001$]. Approximately 60% of the sample reported they had undertaken Q-Ride training which is a reflection of the sample used for this study. As shown in Table 9, around 36% of the sample rode, on average, less than five hours per week [M = 9hrs]. Many riders rode mostly on the weekends [M = 5hrs], although almost half the sample (46%) stated that they rode at least three times per week. Most respondents (87%) rode with others on occasion which provides some evidence of the social nature of riding motorcycles. Approximately 11% of participants had suffered a permanent injury or disability resulting from a motorcycle crash.

Table 9. Motorcycling characteristics of sample

Motorcycling Characteristics	No.	% sample	Mean	SD
Current Open (R) licence	216	95		
Current Restricted (RE) licence	8	4		
No current licence	2	1		
Never had rider training	16	7		
Completed Q-Ride and other training	38	17		
Completed Q-Ride only	99	43		
Completed other (non Q-Ride) rider training only	73	32		
Under 2 years riding experience	27	12	11.3+	10.9+
2 yrs – under five years riding experience	64	28		
5 yrs to under 10 years riding experience	41	18		
10 years or more riding experience	93	41		
Under 2 hours riding per week	24	11	9.0+	11.7+
2 hrs – under 5 hrs riding per week	59	26		
5 hrs to under 10 hrs riding per week	68	30		
10 hours or more riding per week	67	29		
Riding at least 3 times per week	105	46		
Riding once or twice per week	52	23		
Riding two to three times per month	42	18		
Once per month or less	27	12		
Never rides with other people	29	13		
Sometimes or often rides with other people	200	87		
Suffered a permanent injury or disability as a result of a motorcycle crash	25	11		
Had crash* in the past two years	57	25		
Type of motorcycle usually ridden:				
Sports	69	30		
Cruiser	59	26		
Sports/Tourer	50	22		
Tourer	31	14		
Enduro	9	4		
Other	10	4		

* Crash resulting in an injury to a person or serious damage to the motorcycle.
NB. Percentages do not always add up to 100% due to missing data or rounding

+ These data were collected as continuous variables. The categorisation presented here is simply to provide the reader with greater detail.

4.4.2 Psychosocial factors predicting rider intentions

A series of hierarchical multiple regressions were conducted to assess the degree to which the various psychosocial variables of interest predicted the six rider intentions identified in section 4.3.2.2 (see Table 10). The psychosocial variables were entered in four steps, reflecting the theoretical framework underpinning the research. The first block of variables consisted of the standard theory of planned behaviour (TPB) constructs of attitude, subjective norm and perceived behavioural control (PBC). The second block consisted of the additional social-influence variables of interest and included measures of specific subjective norm (SSN), group norm (GN) and two self-identification constructs. The third block of variables consisted of the sensation seeking and aggression measures, while the fourth block included three key socio-demographic characteristics of the participants: age, gender and the average number of hours spent riding each week.

Table 10. Intentions as predicted by TPB, extended with variables of social influence: SSN, GN, and self identification; SS, aggression; and age, average hours riding per week and gender

Intention to handle the motorcycle skilfully (*n* = 183)	**B**	**β**	**sr^2**	**R^2**	**R^2 ch**
Step 1					
Attitude	.17	.14	.01		
Subjective Norm	-.11	-.07	.00		
Perceived Behavioural Control	.17	.26**	.05		
				.13**	
Step 2					
Specific Subjective Norm	.16	.13	.01		
Group Norm	.02	.03	.00		
Self Identification - Safe	.03	.03	.00		
Self Identification - Risky	.07	.10	.01		
				.18	.04
Step 3					
Sensation seeking	-.07	-.11	.01		
Aggression	-.05	-.04	.00		
				.19	.02
Step 4					
Age	.01	.11	.01		
Hours riding on-road per week	.01	.14#	.02		
Gender	.08	.04	.00		
				.22	.03
Intention to maintain 100% awareness (*n* = 182)	**B**	**β**	**sr^2**	**R^2**	**R^2 ch**
Step 1					

Attitude	.07	.04	.00		
Subjective Norm	-.09	-.06	.00		
Perceived Behavioural Control	.12	.19*	.03		
				.09**	
Step 2					
Specific Subjective Norm	.15	.12	.01		
Group Norm	.19	.26**	.05		
Self Identification - Safe	.04	.04	.00		
Self Identification - Risky	.02	.03	.00		
				.21**	.12**
Step 3					
Sensation seeking	-.04	-.05	.00		
Aggression	-.05	-.04	.00		
				.21	.01
Step 4					
Age	.00	.02	.00		
Hours riding on-road per week	.01	.14*	.02		
Gender	.17	.08	.00		
				.24	.02

Intention to refuse to ride impaired (*n* = 179)	**B**	**β**	**sr^2**	**R^2**	**R^2 ch**
Step 1					
Attitude	.07	.06	.00		
Subjective Norm	.01	.01	.00		
Perceived Behavioural Control	.21	.15*	.02		
				.11**	
Step 2					
Specific Subjective Norm	.55	.55**	.22		
Group Norm	.01	.01	.00		
Self Identification - Safe	-.23	-.12	.01		
Self Identification - Risky	-.14	-.07	.00		
				.37**	.26**
Step 3					
Sensation seeking	.21	.13	.01		
Aggression	-.27	-.10	.01		
				.38	. 01
Step 4					
Age	-.01	-.06	.00		

Hours riding on-road per week	.01	.05	.00		
Gender	.05	.01	.00		
				.39	.01
Intention to bend road rules to get through traffic (*n* = 183)	**B**	**β**	**sr²**	***R²***	***R²* ch**
Step 1					
Attitude	.34	.29**	.04		
Subjective Norm	.12	.10	.01		
Perceived Behavioural Control	.06	.04	.00		
				.41**	.
Step 2					
Specific Subjective Norm	.19	.18*	.02		
Group Norm	.10	.11	.01		
Self Identification - Safe	-.01	-.01	.00		
Self Identification - Risky	.00	.00	.00		
				.52**	.11**
Step 3					
Sensation seeking	.30	.21**	.02		
Aggression	.44	.18**	.02		
				.58**	.06**
Step 4					
Age	-.01	-.04	.00		
Hours riding on-road per week	-.00	-.02	.00		
Gender	.19	.05	.00		
				.58	.00
Intention to push limits (*n* = 182)	**B**	**β**	**sr²**	***R²***	***R²* ch**
Step 1					
Attitude	.26	.21**	.02		
Subjective Norm	.19	.13*	.01		
Perceived Behavioural Control	.12	.12*	.01		
				.44**	
Step 2					
Specific Subjective Norm	.17	.19**	.02		
Group Norm	-.01	-.01	.00		
Self Identification - Safe	.10	.07	.00		
Self Identification - Risky	.24	.17**	.02		
				.55**	.11**
Step 3					

Sensation seeking	.42	.35**	.06		
Aggression	.14	.07	.00		
				.62**	.07**
Step 4					
Age	-.01	-.09	.01		
Hours riding on-road per week	-.01	-.04	.00		
Gender	.30	.09	.01		
				.63##	.02##
Intention to perform stunts and/or ride at extreme speeds (*n* = 183)	**B**	**β**	**sr²**	**R^2**	**R^2 ch**
Step 1					
Attitude	.71	.56**	.14		
Subjective Norm	-.06	-.05	.00		
Perceived Behavioural Control	.04	.05	.00		
				.53**	
Step 2					
Specific Subjective Norm	.07	.08	.00		
Group Norm	.01	.02	.00		
Self Identification - Safe	.13	.11*	.01		
Self Identification - Risky	.10	.09	.00		
				.57**	.04**
Step 3					
Sensation seeking	.32	.32**	.05		
Aggression	-.12	-.07	.00		
				.64**	.07**
Step 4					
Age	-.02	-.13*	.01		
Hours riding on-road per week	-.01	-.07	.00		
Gender	.05	.02	.00		
				.66*	.02*

** $p < .01$; * $p < .05$; # $p = .05$; ## $p = .06$.

As shown in Table 10, although all six models significantly predicted rider intentions, there was considerable variability in the amount of variance explained (ranging from 22% to 66%). Notably, larger amounts of variance were explained for the three riskier intentions i.e., *bend road rules to get through traffic* [$R^2 = .58$], *push my limits* [$R^2 = .63$] and *perform stunts and/or ride at extreme speeds* [$R^2 = .66$]. The contribution of each of the different sets of variables is discussed below.

In all six models, the combination of the standard TPB variables (Step 1) significantly predicted rider intentions. However, as with the overall models, the contribution of the TPB variables was most notable for the three riskier intentions: *bend road rules to get through traffic* [$R^2 = .41$], *push my limits* [$R^2 = .44$] and *perform stunts and/or ride at extreme speeds* [$R^2 = .53$]. In the case of the

riskier intentions, the strongest of the TPB predictors was attitude, accounting for 4% of unique variance in intentions to *bend road rule*s, 2% for *push my limits,* and 14% for *perform stunts and/or ride at extreme speeds*. Subjective norm and PBC also proved significant predictors of intention to *push my limits.* In contrast, the only TPB variable that proved a significant predictor of the safer intentions was PBC, accounting for 5% of unique variance in intention to *handle the motorcycle skilfully*, 3% for *100% awareness*s, and 2% for *refuse to ride impaired.*

In five of the six regression models, the inclusion of the four additional social-influence variables at Step 2 contributed to a significant increase in the amount of variance explained (ranging from 4% to 26%). Notably, the specific subjective norm variable contributed 22% of unique variance to the intention to *refuse to ride impaired*, 2% to *bend road rules*, and 2% to *push my limits*. In addition, group norm was a significant predictor of intention to *maintain 100% awareness*, self-identification as a risky rider was a significant predictor of intention to *push my limits*, and self-identification as safe rider was a significant predictor of intention to *perform stunts and/or rider at extreme speeds*.

As expected, the addition of the sensation seeking and aggression variables at the third step only proved significant for the three risky intentions, contributing 6% of additional variance for intention to *bend rules,* 7% for intention to *push limits* and 7% for intention to *perform stunts and/or ride at extreme speeds*. Overall, sensation seeking proved the strongest of the predictors accounting for 2%, 6% and 5% of unique variance, respectively, in these intentions.

The inclusion of the socio-demographic variables at the fourth step was only significant for intention to *perform stunts and/or ride at extreme speeds* [R^2 = .66; R^2 ch = .02], although it approached significance [p = .06] for intention to *push my limits*. Age was a significant predictor of the intention to *perform stunts and/or ride at extreme speeds* (younger people were more likely to intend to engage in this behaviour) [p < .05]. A greater average number of hours ridden per week predicted increased intentions to *maintain 100% awareness* [p = .04; β = .14; although the R^2 ch = .02 was not significant]. More hours ridden also approached significance [p = .05] for increased intentions to *handle the motorcycle skilfully*. Gender did not emerge as a significant predictor of any of the six intentions.

These additional socio-demographic variables were also subjected to t-test analyses to explore whether differences emerged between those riders who sometimes rode in groups and those who always rode alone. There was a significant age difference between riders who reported they sometimes rode in a group [t (224) = -2.62; p < .01; M = 45.3] compared with those who reported they always rode alone [M = 39.7]. However, no significant difference was found for gender [t (225) = 1.02; p = .31] nor average hours riding [t (221) = 0.63; p = .53].

4.4.3 Psychosocial factors predicting self-reported rider behaviour

A principal tenet of the TPB is that intentions will predict behaviour (Ajzen, 1985, 1991). In addition, the theory contends that PBC can directly (and independently) predict behaviour, whilst attitude and subjective norm should not (since their influence is subsumed within intention). Therefore, hierarchical regression was used to both test the TPB and to assess whether the other variables of interest had any significant influence on behaviour, over and above the TPB variables. The results of the hierarchical regressions conducted for each of the six behaviours of interest are reported in Table 11.

Table 11. Self-reported behaviour as predicted by TPB; extended with variables of social influence: SSN, GN, and self identification; SS, aggression; and age, average hours riding and gender

Behaviour scale of handling errors (*n* = 183)	**B**	**β**	**sr²**	***R²***	***R²* ch**
Step 1					
Behavioural Intention	-.16	-.23**	.03		
Perceived Behavioural Control	-.06	-.13	.00		
				.13**	
Step 2					
Attitude	-.06	-.07	.00		
Subjective Norm	.09	.09	.01		
				.14	.01
Step 3					
Specific Subjective Norm	-.11	-.13	.01		
Group Norm	.04	.08	.00		
Self Identification - Safe	-.05	-.09	.00		
Self Identification - Risky	-.07	-.14	.01		
				.17	.03
Step 4					
Sensation Seeking	.10	.22*	.01		
Aggression	.25	.31**	.06		
				.26**	.09**
Step 5					
Age	.01	.18*	.01		
Hours riding on-road per week	-.01	-.09	.00		
Gender	.10	.08	.00		
				.30*	.04*
Behaviour scale of awareness and concentration errors (*n* = 182)	**B**	**β**	**sr²**	***R²***	***R²* ch**
Step 1					

Behavioural Intention	-.16	-.28**	.06		
Perceived Behavioural Control	.02	.06	.00		
				.17**	.
Step 2					
Attitude	-.13	-.14	.01		
Subjective Norm	.04	.05	.00		
				.18	.01
Step 3					
Specific Subjective Norm	-.09	-.12	.01		
Group Norm	-.03	-.08	.00		
Self Identification - Safe	-.02	-.04	.00		
Self Identification - Risky	-.08	-.15	.01		
				.23*	.05*
Step 4					
Sensation Seeking	.09	.20*	.02		
Aggression	.21	.26**	.05		
				.31**	.08**
Step 5					
Age	.01	.11	.01		
Hours riding on-road per week	.00	-.01	.00		
Gender	.08	.06	.00		
				.32	.01
Behaviour scale of riding impaired (*n* = 179)	**B**	**β**	**sr^2**	***R*^{2}**	***R*^{2} ch**
Step 1					
Behavioural Intention	-.05	-.16$^{\#}$	.01		
Perceived Behavioural Control	.00	.00	.00		
				.04*	
Step 2					
Attitude	-.04	-.10	.01		
Subjective Norm	.02	.06	.00		
				.05	.01

Step 3					
Specific Subjective Norm	-.03	-.09	.00		
Group Norm	.04	.13##	.01		
Self Identification - Safe	-.10	-.17*	.02		
Self Identification - Risky	-.07	-.11	.01		
				.17**	.12**
Step 4					
Sensation Seeking	.16	.32**	.05		
Aggression	.28	.33**	.08		
				.37**	.20**
Step 5					
Age	.00	.03	.00		
Hours riding on-road per week	.00	.00	.00		
Gender	-.02	-.01	.00		
					.00
				.37	

Behaviour scale of bending road rules (*n* = 183)	**B**	**β**	**sr²**	***R²***	***R²* ch**
Step 1					
Behavioural Intention	.25	.38**	.06		
Perceived Behavioural Control	.05	.07	.00		
				.49**	
Step 2					
Attitude	.15	.19**	.02		
Subjective Norm	-.09	-.12*	.01		
				.55**	.06**
Step 3					
Specific Subjective Norm	-.11	-.16*	.01		
Group Norm	.12	.19**	.02		
Self Identification - Safe	-.11	-.10	.01		
Self Identification - Risky	-.06	-.05	.00		
				.59**	.04**
Step 4					
Sensation Seeking	.24	.22**	.03		
Aggression	.34	.21**	.03		
				.66**	.07**
Step 5					
Age	.00	.02	.00		

Hours riding on-road per week	-.01	-.04	.00		
Gender	-.13	-.05	.00		
				.67	.01
Behaviour scale of pushing the limits (*n* = 182)	**B**	**β**	**sr²**	***R²***	***R²* ch**
Step 1					
Behavioural Intention	.16	.34**	.04		
Perceived Behavioural Control	-.00	-.01	.00		
				.43**	
Step 2					
Attitude	.06	.10	.00		
Subjective Norm	-.08	-.12##	.01		
				.47**	.03**
Step 3					
Specific Subjective Norm	-.01	-.01	.00		
Group Norm	.01	.03	.00		
Self Identification - Safe	-.04	-.06	.00		
Self Identification - Risky	.05	.08	.00		
				.51**	.05**
Step 4					
Sensation Seeking	.16	.28**	.03		
Aggression	.16	.16**	.02		
				.58**	.07**
Step 5					
Age	.00	.02	.00		
Hours riding on-road per week	.01	.10##	.01		
Gender	-.03	-.02	.00		
				.59	.01
Behaviour scale of extreme speeds and stunts (*n* = 182)	**B**	**β**	**sr²**	***R²***	***R²* ch**
Step 1					
Behavioural Intention	.21	.29**	.03		
Perceived Behavioural Control	.01	.01	.00		
				.45**	
Step 2					
Attitude	.13	.14	.01		
Subjective Norm	-.13	-.14**	.01		
				.48*	.03*
Step 3					

Specific Subjective Norm	-.01	-.02	.00		
Group Norm	.01	.02	.00		
Self Identification - Safe	-.02	-.02	.00		
Self Identification - Risky	.08	.10	.00		
				.53**	.05**
Step 4					
Sensation seeking	.20	.27**	.03		
Aggression	.33	.27**	.05		
				.68**	.15**
Step 5					
Age	-.01	-.11*	.01		
Hours riding on-road per week	.01	.06	.00		
Gender	-.07	-.03	.00		
				.69	.01

** $p < .01$; * $p < .05$; $^{\#}$ $p = .05$; $^{\#\#}$ $p = .06$.

Overall, all six models proved relatively successful in predicting self-reported riding behaviour, accounting for between 30% and 69% of the variance. However, as was the case for intentions, considerably larger amounts of variance were explained for the three volitional risk-taking behaviours i.e. *bend road rules to get through traffic* [$R^2 = .67$], *push my limits* [$R^2 = .59$] and *perform stunts and/or ride at extreme speeds* [$R^2 = .69$].

The pattern of results for each of the behaviours was also largely as expected. Consistent with the TPB, intentions were a significant predictor (at $p \leq .05$) of all six behaviours. However, for two of the behaviours (*bend road rules* and *perform stunts and/or ride at extreme speeds)*, attitude and/or subjective norm emerged as significant predictors; while subjective norm approached significance [$p = .06$] for *push my limits*. Similarly, one or more of the additional social influence variables proved significant predictors of two behaviours (*bend road rules* and *ride while impaired)*. In the case of *bend road rules*, both the specific subject norm and the group norm variables were significant. For *ride while impaired*, self identification as a safe rider was a (negative) significant predictor, while group norm approached significance.

Over and above this, sensation seeking and aggression emerged as strong predictors of all six behaviours, together accounting for between 7 – 20% of additional variance. In particular, these two variables accounted for relatively large amounts of additional variance in the *ride while impaired* [R^2 ch = .20] and *perform stunts and/or ride at extreme speeds* [R^2 ch = .15] variables.

Interestingly, the three socio-demographic variables added at the 5th step explained vary little additional variance. Indeed, the addition of these variables only proved significant in the case of *handling errors*, accounting for a modest 4% of additional variance.

4.4.4 The relationship between self-reported crash involvement and the study variables

As noted in Table 9 (see section 4.4.1), 57 (25%) of the 229 participants reported being involved in at least one crash in the previous two years that resulted in the injury of someone or serious damage to their motorcycle or another vehicle. Of these 57 participants, 45 reported being involved in one crash, 8 in two crashes and 4 in three crashes.

Analyses were conducted to examine whether there were any significant associations between the study variables and participants' self-reported crash history. As noted in section 4.3.5, Spearman's Rho was used to investigate these associations as uneven cell sizes violated the assumptions for a point-biserial correlation. The results of these analyses are reported in Appendix C.

Overall, very few significant associations were found between the study variables and the participants' self-reported crash history. A significant association was found between self-reported crashes and the participants' attitude to *refusing to ride whilst impaired.* In other words, the riders who had crashed in the past two years were less likely to strongly agree with the statement: "*refusing to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in any way* is important to me" compared with riders who had not crashed [r_s = -.18; p = .01]. In addition, a significant association was found between self-reported crashes and perceived behavioural control in relation to *perform stunts and/or ride at extreme speeds* [r_s = -.17; p = .01]. In other words, those participants who had crashed in the past 2 years had less perceived control over whether or not they would *perform stunts and/or ride at extreme speeds*.

4.4.5 The relationship between self-reported traffic offence involvement and the study variables

A total of 101 (44%) participants reported being convicted of at least one traffic offence in the previous two years. Of these, 63 reported being convicted of one offence (which was usually speeding in either a car or on their motorcycle), 22 reported two offences, 8 reported three, 4 reported four, 3 reported five, and 1 reported being charged with six.

Non-parametric correlation (Spearman's Rho) analyses were once again conducted to examine the relationship between the study variables of interest and the participants' self-reported traffic offence history. There were a number of significant correlations found and a complete table of the correlations is presented in Appendix D.

Firstly, significant (albeit weak) associations were found between the participants' self-reported traffic offence involvement and the three 'risky' intentions examined in the study:

- intention to *bend the road rules* [r_s = .17; p < .05];
- intention to *push my limits* [r_s = .16; p < .05]; and
- intention to *perform stunts and/or ride at extreme speeds* [r_s = .14; p < .05].

Secondly, significant (albeit weak) associations were found between self-reported traffic offences and a number of the TPB and other social influence related variables, including:

- attitude favourable to bending road rules [r_s = .13; p < .05];
- attitude favourable to pushing the limits [r_s = .17; p < .05];
- subjective norm favourable to pushing the limits [r_s = .17; p < .05];
- specific subjective norm favourable to bending road rules [r_s = .19; p < .01];
- specific subjective norm favourable to pushing the limits [r_s = .16; p < .05];
- group norm favourable to bending road rules [r_s = .15; p < .05];
- self identity as a safe rider (negative correlation) [r_s = -.17; p < .05]; and
- self identity as a risky rider [r_s = .20; p < .01].

Thirdly, a significant association was found between self-reported traffic offences and a propensity for sensation seeking [r_s = .23; p = .001]. Finally, significant associations were found between self-reported traffic offence involvement and five of the six self-reported behaviours examined in the study, as well as the overall total (composite) measure of behaviour:

- making handling errors [r_s = .18; p < .01];
- riding impaired [r_s = .24; p < .001];
- bending the road rules [r_s = .28; p < .001];
- pushing the limits [r_s = .25; p < .001];
- performing stunts and/or riding at extreme speeds [r_s = .27; p < .001]; and
- total self-reported behaviours [r_s = .30; p < .001].

4.5 Discussion

This study has provided a greater understanding of the complexity of influences on rider intentions and behaviour. Although the various variables examined in the study were able to significantly predict all six rider intentions, they proved more effective in accounting for the three intentions relating to volitional risk-taking behaviour i.e., intentions to *bend road rules to get through traffic*, *push my limits* and *perform stunts and/or ride at extreme speeds.* In these cases, the variables that proved particularly important were the attitude construct within the TPB and sensation seeking. In contrast, the PBC construct within the TPB significantly predicted the three 'safer' intentions. In this regard, intentions to perform 'safer' riding behaviours appear to depend more on the amount of control a person perceives they have over the behaviour rather than a conscious decision to ride in a risky or unsafe manner. These findings tend to confirm Ajzen's (1991) assertion that PBC "*should become increasingly useful as volitional control over the behaviour declines*" (pg. 185). In contrast, 'riskier' riding intentions appear to be influenced by a much wider range of factors such as attitude, SSN, and sensation seeking, which is also supported by the literature (e.g., Parker et al., 1992; Zuckerman & Neeb, 1980).

Consistent with the TPB, the participants' intentions relating to the six behaviours of interest were also a significant predictor of their self-reported behaviour. (However, as noted below, some care needs to be taken when interpreting this result given that the participants' intentions were measured at the same time as their self-reported behaviour, rather than at a prior point in time.) In addition, a propensity for sensation seeking and aggression emerged as strong predictors of all six behaviours, together accounting for between 7 – 20% of additional variance. Once again, the variables examined in this study were better able to predict the three volitional risk-taking behaviours i.e. *bend road rules to get through traffic* [R^2 = .67], *push my limits* [R^2 = . 59] and *perform stunts and/or ride at extreme speeds* [R^2 = .69].

Overall, the study hypotheses were largely supported. Strong support was found for four hypotheses (H_1, H_2, H_3, H_7), while general or partial support was found for four others (H_6 H_8, H_9 and H_{11}). However, little or no support was found for H_4, H_5 and H_{10}. The results are discussed in detail below.

4.5.1 Support for study hypotheses

H_1 The TPB will predict intentions to perform the six rider behaviours of interest.

As the standard TPB significantly predicted intentions to perform each of the six behaviours, this hypothesis was supported. The TPB explained between 41% and 53% of the variance in the three riskier intentions (to *bend the road rules to get through traffic*; *push my limits*; and *perform stunts and/or ride at extreme speeds*). In comparison, the proportion of variance explained for the three safer intentions (to *maintain 100% awareness*, *handle the motorcycle skilfully*, and to *refuse to ride impaired*) was relatively low (ranging from 9% to 13%, see Table 10).

Attitude emerged as a significant predictor of all three riskier intentions, with the proportion of unique variance explained ranging from 2% to 14%. This suggests that an individual's positive or negative evaluation of 'risky' behaviours has a much stronger influence on their intentions than does their evaluation of 'safer' behaviours.

In contrast, PBC was a significant predictor for all three of the 'safer' intentions, accounting for between 2% and 5% of unique variance in these items. This result suggests that riding safely may not always be under the volitional control of the rider and is consistent with the results of Study 1.

SN emerged as a significant predictor for only one of the intentions (*push my limits*). The relatively poor performance of the subjective norm variable in these analyses is consistent with many other studies examining the TPB (Armitage & Conner, 2001a).

H_2 *Extending the TPB to include a specific subjective norm, group norm, and self identification variables will explain more variance in intentions to perform the six behaviours of interest than the standard TPB model.*

This hypothesis was mostly supported. Whilst the extended model did explain more variance than the standard TPB model (ranging from 4% to 26% extra variance explained), in the case of intentions to *handle my motorcycle skilfully* this was not a significant difference (see Table 10). The greatest change [R^2 ch = 26%] was for the intention to *refuse to ride impaired* where the SSN contributed and additional 22% of variance.

Of the four additional variables of social influence, the SSN appeared to make the strongest contribution, emerging as a significant predictor of three intentions (*bend road rules, refuse to ride impaired,* and *push my limits*). Group norm proved a relatively strong predictor of intention to *maintain 100% awareness* (accounting for 5% of unique variance), but of no other intentions. Neither of the self identification variables performed strongly, only predicting one intention each.

H_3 *The specific subjective norm will better predict intentions than the standard subjective norm variable.*

This hypothesis was also generally supported. Whilst some overlap between the two constructs (SN and SSN) appeared likely, the moderate correlations between the two suggest that they are related, but distinct constructs (see Table 11 in Appendix B). Overall, the SSN was a better predictor of intentions than the SN, having a larger beta coefficient in all regression models (see Table 10). Moreover, as noted above, the SSN was a significant predictor of three of the intentions, while the SN was only significant for intention to push limits (of which SSN was a stronger predictor).

H_4 *The perceived normative behaviour of the referent group will significantly predict intentions.*

This hypothesis received little support. As noted above, group norm (GN) was a significant predictor of only one of the intentions examined (intention to *maintain 100% awareness*). Nonetheless, in this case it was a relatively strong predictor accounting for 5% of unique variance.

H_5 *Self identification as a safe rider will be a significant predictor of the three 'safer' riding intentions.*

Self identification as a safe rider did not emerge as a significant predictor of intentions to perform these three behaviours, so the hypothesis was not supported. However, contrary to expectations, the variable did prove a significant predictor of intentions to *perform stunts and/or ride at extreme speeds.* While the beta was positive in the model, the zero-order correlation was negative [r = -.33], which suggests that people who intend to *perform stunts and/or ride at extreme speeds* are less likely to identify as a safe rider. This anomaly in the signs appeared to be due to SSN, GN, self identification as a risky rider, and SS acting as suppressor variables.

H_6 *Self identification as a risky rider will be a significant predictor of the three 'riskier' riding intentions.*

The support for this hypothesis was very limited. Self identification as a risky rider only proved a significant predictor of intentions to *push my limits*.

H_7 *Sensation seeking scores will significantly predict the three 'riskier' riding intentions and related behaviours, over and above other psychosocial influences.*

Strong support was obtained for this hypothesis. Sensation seeking emerged as a significant (positive) predictor of all three of the 'riskier' intentions (i.e. *bend road rules, push my limits*, and *perform stunts and/or ride at extreme speeds*) over and above the extended TPB variables (see Table 10). In addition, sensation seeking emerged as a significant predictor of all six self-reported behaviour measures, after accounting for the TPB and other social-influence variables (see Table 11).

H_8 *A propensity to engage in aggressive riding behaviour will significantly predict the three 'riskier' riding intentions and related behaviours, over and above the influence of other psychosocial variables.*

This hypothesis was partially supported. While a higher propensity for aggressive riding (as indicated by self-reported instances of such behaviour) did significantly predict stronger intentions to *bend the road rules to get through traffic*, it did not emerge as a significant predictor of intentions to either *push my limits* or *perform stunts and/or ride at extreme speeds* (see Table 10). However, a propensity for aggressive riding did emerge as a significant predictor of all six self-reported behaviours, after accounting for the TPB and other social-influence variables (see Table 11).

H_9 *Intentions and PBC relating to the six rider behaviours examined in this study will significantly predict self-reported behaviour.*

This hypothesis was partially supported. Consistent with the TPB, intentions emerged as a significant predictor (at $p \leq .05$) of all six behaviours examined in the study. However, PBC did not prove a significant predictor of any of the behaviours (see Table 11). Therefore, while PBC was found to be a significant predictor of all three of the 'safer' intentions (see Table 10), it does not appear to have any direct effect on motorcycle rider behaviour, at least as operationalised in the context of this research.

Moreover, as noted earlier, some care needs to be taken when interpreting the results given that the participants' intentions were measured at the same time as their self-reported behaviour, rather than at a prior point in time. This raises potential causal ordering problems, and assumes that intentions are relatively stable over time. A stronger test of this hypothesis would require delaying the measurement of behaviour until after a period of time has elapsed.

H_{10} *A positive association will be found between the intentions and behaviour of the participants and their self-reported crash involvement.*

This hypothesis was not supported. No significant associations were found between the participants' self-reported crash involvement and either their intentions or self-reported behaviour.

These results may be accounted for by a variety of factors. Firstly, it is possible that the six aspects of motorcycle behaviour examined in this research do not have a close relationship with crash involvement. While this is possible, this conclusion does not seem consistent with either the research evidence reviewed in Chapter 2 or the findings of the focus group study (both of which informed the selection of the six behaviours). Alternatively, it is possible that the findings are due to shortcomings in the way that crash involvement was measured in this study. In particular, given that crashes are rare events, it was necessary to select a time period of two years to ensure that (some) participants would have experienced a sufficient number of crashes to facilitate the analyses. However, this may have introduced two problems. Firstly, the selection of a two-year period raises the possibility of recall problems that may have reduced the accuracy and reliability of the data. Secondly, it is possible that the two year period was too long to accurately reflect the current intentions and behaviour of the participants. Indeed, it is possible that the experience of being involved in a crash in the first part of the two year period may have had an effect on the subsequent intentions and behaviour of a participant, which altered their likelihood of being involved in a crash in the latter part of the period. Nonetheless, as discussed below, significant associations were found between self-reported traffic offences (which were also measured over a two year period) and the intentions and behaviour of the participants. Therefore, it is possible that the failure to find significant relationships in the case of self-reported crashes is due to an insufficient sample size, given the relatively rare nature of crashes. Finally, this problem could also reflect other problems with the measurement of crashes in this study that are not apparent. For example, it is possible that the conceptualisation of a crash used in this study was too broad, since it included both injury-related and property damage only crashes. While data relating to these two types of crashes were collected, there were an insufficient number of injury-related crashes reported to permit a meaningful analysis.

H_{11} *A positive association will be found between the intentions and behaviour of the participants and their self-reported traffic offence involvement.*

This hypothesis was generally supported. Significant (albeit weak) associations were found between the participants' self-reported traffic offence involvement and three of the six intentions examined in the study. Not surprisingly, these three intentions were those relating to volitional risk-taking behaviours (i.e. *bend the road rules, push my limits* and *perform stunts and/or ride at extreme speeds*).

In addition, significant associations were found between their self-reported traffic offences and five of the six self-reported behaviours examined. These results contrast with those discussed above relating to self-reported crash involvement. Taken together, it is possible that self-reported traffic offences represent a more reliable indicator of intentions and behaviour, due to the higher likelihood of participants being detected for an offence as opposed to being in a crash. Alternatively, it is possible that the influence of intentions on behaviour is somehow more evident in those types of behaviours that typically result in traffic offences, rather than in crashes.

4.5.2 Summary of factors influencing rider intentions and behaviour

The eleven hypotheses which guided this study tested how well the theoretical constructs of interest predicted rider intentions and behaviour in relation to six particular aspects of motorcycling. As discussed above, while some broad similarities emerged in the pattern of results, particularly for the three behaviours involving more volitional risk-taking, a unique set of significant predictors emerged for each of the intentions and behaviours. Accordingly, this section will summarise the results in terms of the specific psychosocial factors influencing each of the intentions and behaviours.

4.5.2.1 Handling the motorcycle skilfully

This particular aspect of motorcycle behaviour was the least well explained by the psychosocial variables examined in the study. The regression model examining intentions to *handle the motorcycle skilfully* only accounted for 22% of the variance, with PBC emerging as the only significant predictor. Similarly, the model examining self-reported behaviour also proved the least successful, explaining only 30% of the variance in *handling errors*. Besides intentions, three variables emerged as significant predictors of *handling errors*: sensation seeking, aggressive riding and age. In other words, the likelihood of committing a handling error increases with the propensity to engage in sensation seeking and aggressive riding, and with increasing age. However, this latter result may not necessarily indicate that older riders are less skilful than their younger counterparts. Rather, it may only indicate the older riders are more prepared to admit make handling errors than younger riders.

Together, these results are consistent with the view that riders do not generally choose to make handling errors. Rather, the likelihood of a rider handling the motorcycle skilfully in the future is largely a matter of control (i.e. PBC), as opposed to conscious (volitional) choice. Moreover, the degree of control that riders can exercise over the handling of the bike is subject to the influence of other factors such as their propensity for sensation seeking and aggressive riding (and possibly age).

4.5.2.2 Maintaining 100% awareness

This particular aspect of motorcycle riding was the next least well explained by the psychosocial variables examined in the study. The regression model examining intentions to *maintain 100% awareness* only accounted for 24% of the variance, with PBC, group norm and hours riding per week emerging as significant predictors. In relation to PBC, many riders interviewed in Study 1 stated that, whilst they would like to remain 100% aware at all times, in practice, this can be very difficult. The results of the present study suggest that those who felt that maintaining 100% awareness was more within their control were more likely to intend to do so. More hours riding per week may be significant due to a greater salience of occasions where there has been a need for awareness, or perhaps more frequent riders are riding in heavier traffic conditions and thus need to maintain greater alertness. The significance of GN indicates that people who ride in a group with members who try to *maintain 100% awareness* are themselves, more likely to intend to *maintain 100% awareness,* suggesting that the normative appropriateness of the behaviour amongst riding groups is important in this instance.

Similarly, the psychosocial variables of interest only explained 32% of the variance in self-reported *awareness and concentration errors*. Besides intentions, the only variables that proved significant predictors of these errors were sensation seeking and aggressive riding. Therefore, as was the case for *handling errors*, a propensity to engage in sensation seeking and aggressive riding appears to increase the likelihood of committing awareness and concentration related errors while riding.

4.5.2.3 Riding while impaired

This aspect of riding appeared to be the most unpredictable of the six examined in the study. Together, the psychosocial variables of interest explained 39% of the variance in intention to *refuse to ride while impaired*, with both PBC and the specific subjective (SSN) norm emerging as significant predictors. The high unique variance explained by SSN (22%) suggests that a person's perception of what the people that they ride with would want them to do have a strong influence on this particular intention.

However, a number of anomalies emerged in the results. Firstly, intention to *refuse to ride while impaired* did not correlate significantly with any of the other intentions. Secondly, the influence of intention on self-reported riding while impaired was marginal (p = .05) and overshadowed by the

sensation seeking and aggression measures. It is possible that these anomalies are a product combining different concepts (i.e., fatigue with alcohol and/or drug use with general impairment) into the one variable, or due to the item's specific wording. Therefore, these results should be treated with some caution.

4.5.2.4 Bending road rules to get through traffic

Along with the other two volitional risk-taking behaviours, this aspect of riding behaviour was well explained by the psychosocial variables of interest. The model examining intention to *bend the rules* explained 58% of the variance, while the model examining self-reported behaviour explained 67% of the variance in related riding errors. The significant predictors of intentions were attitude, sensation seeking and aggression. These variables were also significant predictors of self-reported bending of the road rules, along with the subjective norm, the specific subjective norm, and group norm variables.

Together, these results suggest that bending of the road rules is strongly influenced by both attitudinal and normative factors, as well as the disposition to sensation seeking and aggression. In other words, those riders who are more likely to bend the rules while riding are those who hold a positive attitude to the behaviour, mix with other people and riders who hold similar views, know other riders who engage in the behaviour, and have a tendency to engage in other risky and aggressive behaviours. This latter result may reflect an element of frustration in traffic, which was mentioned by many riders in Study 1.

4.5.2.5 Pushing limits

This aspect of rider behaviour was well explained by the study variables. Together, they accounted for 63% of the variance in intention to *push my limits* and 59% of self-reported errors of this type. The intention to *push my limits* had more significant predictors than any other intention: all three standard TPB items, plus SS, SSN, and self identification as a risky rider. This result may reflect the wide variety of reasons why people push their limits. As discussed in Study 1, people may push their limits unintentionally, or as a deliberate strategy to improve their riding ability, as a result of peer pressure or to show off, or simply for the thrill of it. Consistent with this, the significant predictors of self-reported 'pushing limits' errors, besides intention, were sensation seeking and aggression.

4.5.2.6 Performing stunts and/or riding at extreme speeds

As with the other volitional risk-taking behaviours, this aspect of rider behaviour was well explained by the study variables. Together, the study variables accounted for 66% of the variance in intention to *perform stunts and/or ride at extreme speeds* and 69% of self-reported behaviour. The intention to *perform stunts and/or ride at extreme speeds* was predicted mainly by attitude, but also by low self identification as a safe rider, sensation seeking, and age (youthfulness). Besides intention, the significant predictors of self-reported behaviour of this type were subjective norm, sensation seeking, aggression and age. Together, these results suggest that people who hold a more positive attitude to these behaviours and find an inherent thrill in performing them are most likely to (intend and) engage in them. In addition, these riders are more likely to be younger, but know others who do not necessarily support such behaviour (as indicated by the negative beta for subjective norm).

Interestingly, the PBC of the participants in relation to *performing stunts and/or riding at extreme speeds* was one of the few variables significantly correlated with self-reported crashes. This correlation was negative, indicating that self-reported crash involvement was greater among those with low PBC.

4.5.3 Strengths and limitations of the study

A major strength of this study was its strong theoretical foundation. The study used the TPB as the basis for the investigation, given its previous success in predicting intentions and behaviour in numerous contexts, including road safety (Ajzen, 1991; Armitage & Conner, 2001a). In addition, a range of other personal and social variables were included to assess their influence on rider behaviour.

In terms of the theory, this study provided strong support for those who argue that the TPB does not adequately capture the full impact of social influence (e.g., Terry & Hogg, 1996). The results indicated that SN is a weak predictor of rider behaviour compared to the SSN. This result is not surprising in light of other studies which have found little evidence of efficacy for the SN (e.g., Rutter et al., 1995). However, the fact that both the SN and SSN emerged as significant predictors of the intention to *push my limits* in this study suggests that SSN may be most useful as an addition to the TPB, rather than a replacement of the SN. The other items of social influence which were tested (GN and self identification) did not perform as strongly as the SSN. In addition, the study has confirmed that a propensity for both sensation seeking and aggression influence rider intentions and behaviours, over and above the TPB, particularly in the case of more volitional, risk-taking behaviours.

A second strength of the study was that it examined both safe and risky riding intentions. Most other studies published to date have concentrated solely on risky behaviours and intentions. There is little, if any, information published which analyses the factors which predict safer riding behaviour.

A final strength of the study was that the questionnaire was developed primarily on the basis of information provided by motorcyclists in Study 1. Relevant literature was then used to further refine the items used. This exploratory approach to the questionnaire development assisted to identify issues that riders consider important to their safety, and improved the face validity of the survey by ensuring the content was relevant to Australian motorcyclists.

Nonetheless, the study also featured a number of limitations which should be borne in mind. The study mainly attracted recreational, older, riders from South East Queensland. Only 4% of the sample was younger than 25 years, so the behavioural intentions of this age group may not be well represented which is a significant limitation of this study. Also, the intentions of unlicensed riders, who may be at the highest risk of crashing (de Rome et al., 2002; Haworth et al., 1994), have not been captured in this study as only two respondents reported they did not hold a current motorcycle licence. Therefore, caution needs to be exercised when generalising the results of this study to motorcycle riders in general.

The study questionnaire was anonymous in nature, in order to enhance the likely response rate. Consequently, no address details were recorded for participants, thus making it impossible to send them reminder notices. It is feasible that the absence of a reminder system actually resulted in a lower response rate, and perhaps some sample bias due to differences between respondents and non-respondents. The length and complexity of the survey (9 pages, excluding introductory and explanatory pages) may also have negatively influenced the response rate. A study by Reeder et al. (1997) found that lower levels of literacy were predictive of motorcycle use. These results raise the possibility that there may be a higher proportion of literacy problems amongst motorcyclists compared with the general population. If this is the case, future studies of motorcyclists may benefit from interview-based methods to ensure the views of people with lower levels of literacy are captured.

The survey incorporated only one measure of attitude, subjective norm, perceived behavioural control, specific subjective norm, group norm, and intention for each of the six behavioural intentions. Ideally, at least two items should be included to increase reliability. The length of the

questionnaire made this option impractical so the results are based on an assumption that these constructs were operationalised in a valid and reliable manner. As the TPB proposes that intentions predict behaviour, intentions in this case are assumed to be an indirect measure of behaviour (Ajzen, 1985, 1988, 1991). Further research is required to confirm whether intentions are a good predictor of behaviour in this particular context. Finally, intentions and self-reported behaviour were both measured at the same time in this research. A more valid test of the TPB would involve the measurement of intentions prior to behaviour.

4.6 Chapter Summary

This study has provided an insight into the complexity of influences on rider intentions and behaviour. Together, the various variables examined in the study were able to significantly predict all six rider intentions and associated behaviours. However, they proved more effective in accounting for those behaviours that were of a more deliberative (volitional), risk-taking nature (i.e., *bending road rules to get through traffic*, *pushing my limits* and *performing stunts and/or riding at extreme speeds*) than those involving non-volitional errors. Consistent with the TPB, the participants' intentions relating to the six behaviours of interest were significant predictors of their self-reported behaviour. In addition, a propensity for sensation seeking and aggression emerged as strong predictors of all six behaviours.

Unfortunately, no significant associations were found between the participants' self-reported crash involvement and either their intentions or self-reported behaviour. It is unclear whether these finding were due to the types of behaviours selected for study in this research or problems in the way that crash involvement was measured. In contrast, significant (albeit weak) associations were found between the participants' self-reported traffic offence involvement and three of the six intentions examined in the study. Not surprisingly, these three intentions were those relating to the volitional, risk-taking behaviours (i.e. *bending the road rules, pushing limits* and *performing stunts and/or riding at extreme speeds*). In addition, significant associations were found between the participants' self-reported traffic offences and five of the six self-reported behaviours examined. Indeed, the strongest association was found between the composite behaviour measure and self-reported crashes.

One of the main aims of this program of research was to develop a tool for identifying high-risk motorcycle riders. Together, the results of this study suggest that the intention and behaviour scales developed in this study represent a potentially useful tool for assessing risky motorcycle rider behaviour, at least as measured by traffic offence involvement. However, further work is required to establish the link between the intention and behaviour scales and crash involvement.

A more comprehensive integration of the results of Study 1 and Study 2 will be presented in the next chapter.

5 CONCLUSION

5.1 Review of findings

The research presented in this report has examined the psychosocial factors influencing on-road riding, using an extended version of the theory of planned behaviour. The qualitative study (Study 1) presented in Chapter 3 was used to explore motorcyclists' attitudes, motivations, and behaviours which they associate with both safe and risky riding whilst the quantitative study (Study 2, discussed in Chapter 4) built on these findings to explore the factors influencing six specific aspects of rider behaviour. The overarching aims of this research were to improve our understanding of the psychological and social factors influencing rider behaviour and develop a tool for identifying high-risk motorcycle riders.

This chapter will synthesise the information gathered by this program of research and discuss the findings in terms of the research questions listed at the end of Chapter 2. The theoretical and practical contribution of this research to road safety and traffic psychology will also be examined and suggestions for further research identified.

Research question 1: What behaviours do riders identify as being directly related to safe and risky riding?

Conceptual content analysis of the data collected in the Study 1 was used to determine six major types of behaviour that characterise both safer and riskier riding. These six behaviours were:

- Handling the motorcycle skilfully;
- Maintaining concentration and focus on the road environment;
- Not riding whilst impaired;
- Obeying the road rules;
- Not pushing the limits; and
- Not performing stunts or riding at extreme speeds.

It should be noted that, other than the first two behaviours listed above, which all participants agreed were important to rider safety, there was little consensus within the groups about the relative safety or riskiness of these behaviours. These differences are examined more closely below. In addition, the extent to which each of these aspects of behaviour were found in Study 2 to be related to self-reported crash and offence involvement is discussed.

The first concept that was mentioned by all of the focus groups was that safe riding required an ability to handle the motorcycle well enough to avoid the unexpected and to know how to adjust their riding when faced with different weather or road conditions. The motorcyclists interviewed in Study 1 took pride in their ability to handle a motorcycle. Those riders who reported that they had less confidence in their handling skills indicated a desire to become 'better' riders. Therefore, it seems unlikely that many riders consciously choose to handle their motorcycle poorly. Consequently, in Study 2, this concept was operationalised as a 'safer' intention using the words "*handling my motorcycle skilfully …*". Similarly, the associated behaviour was measured in terms of *handling errors* (as opposed to deliberate attempts to mishandle the bike).

The participants in the focus groups also reported that safe riding entailed maintaining awareness of the environment. This concept included other traffic, pedestrians, weather, road conditions,

maintaining active scanning for possible hazards. On occasion, this concept of awareness also included an awareness of 'self' which pertained to behaviours such as adjusting their style of riding if they did not feel 100% or self-monitoring concepts such as responding to a 'gut feeling' to know when they should not ride at all, or back off in a given situation. This concept was also operationalised in Study 2 as a 'safer' condition, using the words "*always being 100% aware of the traffic and surrounding road environment …*" to measure intentions and *awareness errors* to measure the associated behaviour.

Riding whilst impaired was identified as an important issue in all of the focus groups. There was general consensus that drink riding was not safe. Some riders stated that even one alcoholic drink was an unacceptable risk as it impaired their performance. Others said that they were safe riders as long as they stayed below the legal BAC limit. The effect of other drugs on riders was not raised by many groups. There was no consensus on the issue of fatigue as some riders considered riding fatigued was dangerous, whilst others stated that going for a ride whilst fatigued served to wake them up and recharge them. The impairment concept was operationalised as a 'safer' intention in Study 2, using the words "*refusing to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in any way …*", while the associated behaviour was framed in terms of whether the participants had ever ridden while impaired. However, the decision was taken to combine the three themes of alcohol, drugs and fatigue in the measures in the interests of limiting the survey to a manageable length. This may in part have contributed to the failure of these measures to be significantly associated with self-reported crashes (although the impaired riding scale was significantly associated with self-reported offences). Accordingly, any future study which has a specific interest in impairment would benefit from separating fatigue from alcohol and drug impairment. The inclusion of items to measure the influence of stress or mood may also be useful.

All groups in Study 1 mentioned the tendency of riders to 'bend' the road rules to get through traffic. Some riders considered this an essential part of maintaining their safety, others expressed the view that following the road rules was important to their safety. Many participants agreed that one of the major benefits of having a motorcycle was to get through traffic more easily. Whilst convenience appears to be one factor in bending road rules, participants provided various reasons for some practices which involve bending the road rules, such as lane splitting. For example, the design of some motorcycles leads to overheating in heavy traffic conditions, while riders themselves suffer from exposure to the weather conditions, sweltering and dehydrating in the heat (especially with full protective clothing on) and freezing in the cold. Some participants argued that committing a 'minor' traffic infringement, such as lane splitting, was more conducive to their safety than being 100% law abiding in all situations. In contrast, various research studies have linked breaking road rules with crashes (e.g., Rutter et al., 1995). Therefore, while opinions varied among the focus group participants, this aspect of motorcycling was operationalised as a 'riskier' behaviour in Study 2.

The concept of pushing one's limits on the motorcycle was a common theme in the discussions and appeared to be considered a normal part of riding behaviour. The difference between 'safe' pushing of limits and 'risky' pushing of limits appeared to be largely linked to whether it was a conscious controlled choice (safe) or a spur of the moment or uncontrolled event (unsafe). Choosing where, when, and how far to push one's limits was generally regarded as a safe, skill-building behaviour (even if it resulted in a minor crash). Pushing one's limits without proper thought and planning seemed to be considered by most riders as 'risky', yet many participants recounted experiences where they had inadvertently engaged in this riskier form of behaviour as a result of being 'caught up in the moment'. The influence of other riders was also mentioned within this topic. People recounted experiences where they had felt pressured to keep up with others, or to show their skill as a 'good rider', leading them to push their limits in a more unsafe fashion. Consequently, this aspect of motorcycling was operationalised in Study 2 as a 'riskier' condition.

Many participants in Study 1 had engaged in some form of stunt behaviour at some time in their riding history and could recount minor crashes as a result. Although many riders are not interested in performing stunts themselves, generally stunts were considered a fun part of motorcycling, but extremely dangerous if done in the wrong place. All riders interviewed agreed that performing stunts on city streets was a dangerous thing to do, yet some riders who held this view still performed stunts in traffic conditions. This behaviour appeared to be usually motivated by a desire to 'show off' rather than gaining personal satisfaction from perfecting a stunt. When motivated by personal satisfaction, a suitable time and place was planned to perfect such manoeuvres.

The area of motorcycle stunts was one of the few areas of discussion where there appeared to be a definite age and gender bias. The focus group discussions indicated that stunts are most likely to be performed by young males. However, no such age or gender bias was apparent in the group discussions for riding at extreme speeds. Both males and females, older and younger, appeared to enjoy riding fast. Most riders interviewed did not appear to regard riding at very high speeds (e.g., more than double the speed limit) as intrinsically unsafe. The general consensus seemed to be that safe high-speed riding involved planning the time and place so as to minimise risk. Unsafe high-speed riding was done without considering the conditions (e.g., whilst other traffic was present, or on roads without good visibility). However, many of the riders who stated that they rode at very high speeds also reported that they sometimes got 'caught up in the moment', suggesting that this higher level of risk assessment is not used at all times. Accordingly, this aspect of motorcycle rider behaviour was operationalised as a 'riskier' construct in Study 2.

Unfortunately, however, the findings of Study 2 throw little light on the inherent safety or riskiness of the six behaviours of interest, at least in terms of self-reported crash involvement. None of the intention or behavioural measures relating to the behaviours proved to be significantly associated with self-reported crashes. It is possible that this indicates that these behaviours, in reality, do not have a close relationship with crash involvement. However, this conclusion does not seem consistent with either the findings of Study 1 or the research evidence reviewed in Chapter 2. More likely, the findings highlight shortcomings in the way that crash involvement was measured in Study 2 (see section 4.5 for more discussion of this issue).

In contrast, the findings of Study 2 do tend to confirm a link between the six behaviours of interest and self-reported traffic offence involvement. In particular, significant associations were found between self-reported traffic offences and the three 'riskier' intentions examined in the study (i.e. those relating to more volitional risk-taking, namely, *bend the road rules, push my limits* and *perform stunts and/or ride at extreme speeds*). In addition, significant associations were found between traffic offence involvement and five of the six self-reported behaviours examined (the only exception being for *awareness errors*). These results don't necessarily confirm the inherent 'riskiness' of the behaviours examined, since engaging in an illegal behaviour may not always result in a crash. However, they do provide *prima facia* evidence supporting the findings of Study 1.

Research question 2: What are the psychosocial factors that influence rider intentions and behaviour?

The results of Study 2 indicate that each of the six behaviours (and related intentions) examined in this research are influenced, to some degree, by a unique set of factors. However, there were also many commonalities in the results, particularly for the three volitional risk-taking behaviours. This was particularly evident in the case of the participants' intentions. Firstly, the various variables examined in the study proved more effective, overall, in predicting intentions to *bend road rules, push my limits* and *perform stunts and/or ride at extreme speeds*, than was the case for the three 'safer' intentions. Secondly, in the case of the three 'riskier' intentions, the variables that proved particularly important were the attitude construct from the TPB and sensation seeking. In contrast, it was the PBC construct from the TPB that significantly predicted the three 'safer' intentions. As such, while intentions to perform volitional risk-taking behaviours appear to be primarily influenced

by attitudinal and sensation seeking factors, intentions to ride safely are more influenced by the amount of control a person perceives they have over the behaviour. This is consistent with Ajzen's (1991) assertion that PBC "*should become increasingly useful as volitional control over the behaviour declines*" (pg. 185).

The strength of attitude in predicting riskier riding intentions was also supported by the results of Study 1. Participants could readily discuss and rationalise their choice to (or not to) break road rules, push their limits, perform stunts, and ride at extreme speeds. Similarly. almost every rider interviewed in Study 1 talked about the 'thrill' of riding. As there was a good distribution of sensation seeking scores amongst participants in Study 2, clearly not all motorcyclists have a predisposition for sensation seeking. However, riding a motorcycle undoubtedly provides an opportunity for pushing the limits and experience the adrenaline rush associated with risky behaviour. This 'adrenaline rush' was described by several of the participants in Study 1.

Whilst social influences were shown to clearly influence rider intentions in Study 2, subjective norm (SN) performed relatively poorly. The weakness of SN is consistent with the results of other TPB studies (see Armitage & Conner, 2001a), including those investigating the behaviour of road users (e.g., Rutter et al., 1995). Many participants in Study 1 reported that they thought of their families, or their work, whilst riding and this gave them an incentive to ride more safely. However, the weakness of SN in Study 2 suggests that these relationships may not be highly salient when a person is riding. Instead, the people a person rides with (i.e. SSN) emerged as a much more important influence on intentions than other people who are important in a rider's life. This topic is discussed in greater detail below under *Research Question 3*.

Overall, the pattern of results that emerged for the six self-reported behaviours was largely consistent with that obtained for intentions. Firstly, while the various psychosocial variables examined in the study significantly predicted all six behaviours, considerably larger amounts of variance were explained for the three volitional risk-taking behaviours i.e. *bend road rules to get through traffic* [R^2 = .67], *push my limits* [R^2 = .59] and *perform stunts and/or ride at extreme speeds* [R^2 = .69]. Secondly, the results were largely consistent the tenets of the TPB, with intentions proving a significant predictor of all six behaviours. Thirdly, sensation seeking, along with rider aggression, emerged as a strong predictor of all six behaviours. Indeed, together, these two variables accounted for between 7 – 20% of additional variance in the six behaviours. Not surprisingly, these two variables accounted for relatively large amounts of additional variance in the *ride while impaired* [R^2 ch = .20] and the *perform stunts and/or ride at extreme speeds* [R^2 ch = .15] variables.

Consistent with the TPB, very few of the social influence variables emerged as significant predictors of behaviour (confirming that their influence is mediated by the role of intentions). However, a few anomalies did emerge, particularly for the *bend the road rules* behaviour. Three of the social influence variables proved to be significant (albeit weak) predictors of this behaviour: subjective norm, specific subject norm and group norm. In addition, self-identification as a safe rider was a negative predictor of riding *ride while impaired*.

The only socio-demographic factor that proved a significant predictor (over and above the other variables) was age, which was a significant predictor of *handling errors* and *perform stunts and/or ride at extreme speeds*. However, the nature of these results were not consistent, with younger riders being less likely to report making handling errors, but more likely to engage in stunts or extreme speeds.

Research question 3: What is the impact of other riders on intentions and behaviour in a group riding situation?

Together, the results of Studies 1 and 2 illustrate the broad impact that social influences have on rider intentions and behaviour. Participants in Study 1 suggested that other riders can act as both a

positive and negative influence on rider safety. On the positive side, riders can learn from one another and improve their skills by imitating the actions of other riders. It was also suggested that group riding provides safety in numbers; other traffic may be more aware of a group of riders than a lone rider (therefore, reducing the likelihood of 'look but fail to see' incidents). Participants also stated that they talked to other riders, exchanging stories, which often involved a safety aspect. A sizeable proportion of the participants said that other social influences such as family and work commitments helped them to maintain their awareness of safety and to ride more carefully. However, as mentioned previously, the influence of important others (SN) did not emerge as very significant within Study 2, suggesting that these influences may not always be salient. In contrast, Study 2 showed that the SSN (i.e., what a person thinks the other people they ride with would want them to do) may be a more important influence (for better or worse) on rider intentions, particularly when it came to *maintaining 100% awareness*, *bending the road rules*, r*efusing to ride impaired* and *pushing limits.*

On the negative side, some participants in Study 1 spoke of feeling that they needed to keep up with other riders or to show that they can ride as well as others. Whilst a few participants spoke of peer group pressure and comradely competitiveness, such as friendly taunting by others, most riders seemed to believe that the people they ride with would accept them, no matter what their ability was. The egalitarian nature of motorcycling, that all can be accepted regardless of age, social status, or riding ability was often mentioned as one of the attractions of social riding. The importance of the SSN, rather than the GN (i.e., what other riders do), in Study 2 suggests that any desire to prove oneself as a good rider results from a perception of explicit pressure, rather than overt pressure from the group. If this is the case, it seems likely that the desire for social approval influences rider intentions more than the desire to engage in group normative behaviour (although these two items may not be incongruent). According to some of the riders interviewed in Study 1, riding in a group environment can also have a negative influence if riders relinquish their control to the lead rider. One rider called this the 'fishing line effect' where riders in a group simply follow the leader, like fish on a line, without maintaining awareness of their own safety.

5.2 Contribution to theory

This program of research has made a number of important theoretical contributions to the study of road user behaviour. Firstly, the results have confirmed the overall usefulness of the TPB as a means of explaining motorcycle rider intentions and behaviour. Together, the standard TPB variables in Study 2 were able to significantly predict all six rider intentions, accounting for between 22% and 66% of the variance in these intentions. They proved particularly effective in predicting the three volitional risk-taking intentions (*bend the road rules, push my limits*; and *perform stunts and/or ride at extreme speeds)*, explaining between 43% and 52% of the variance in these variables. These results are largely consistent with the meta-analysis conducted by Armitage and Connor's (2001a), which found the TPB predicted approximately 39% of the variance in behavioural intention, and the research of Parker et al. (1992) who found the TPB explained between 23% and 47% of the variance in intentions to commit four traffic violations. Furthermore, rider intentions proved a significant predictor of all six behaviours examined. Together with PBC, intentions accounted for between 4% and 49% of variance in the behaviours. Once again, this a largely consistent with the Armitage and Connor's (2001a) meta-analysis, where intentions were found to account for between 16% and 42% of variance in behaviour.

The second theoretical contribution of this research was to examine both 'risky' and 'safe' intentions and behaviour. Most other road safety studies which have utilised the TPB have concentrated on risky intentions and behaviours. Whilst some studies have examined whether safer riding beliefs and practices predict risky riding practices or crash involvement (e.g., Rutter et al., 1995); little, if any, previous research has been conducted into safer riding intentions using the TPB.

Whilst the research has confirmed that the TPB appears to be more effective in explaining volitional risk-taking behaviours, it still performed relatively well for the 'safer' intentions and related behaviours.

A third contribution of the research was to explore how other social influence variables could augment the TPB. More particularly, it confirmed the assertion that the TPB does not adequately capture the full impact of social influence on intentions, and hence behaviour (e.g., Terry & Hogg, 1996). For example, subjective norm (SN) was found to be a relatively poor predictor of rider intentions. This is consistent with a range of other TPB studies, examining road user behaviour (e.g., Rutter et al., 1995) as well as other behaviours (e.g., Ajzen, 1991; Armitage & Conner, 2001a; Farley, Lehmann & Ryan, 1981; Johnston, White & Norman, 2004; Terry & Hogg, 1996; Terry, Hogg & White, 1999). In contrast, the specific subjective norm (SSN) proved relatively more effective in explaining rider intentions. As such, the results support the assertion that the 'people I ride with' exert a stronger influence over rider intentions than the 'people who are important to me'. There is undoubtedly some overlap between these two groups for many riders; however, the correlation analyses indicated that this overlap was not of a high order [*r* ranging from .08 to .39]. The addition of the SSN undoubtedly added to the power of the models tested in this research project and provides support for the opinion that the traditional subjective norm may not capture social pressure adequately (Terry & Hogg, 1996). However, the fact that both the SN and SSN emerged as a significant predictor of at least one of the intentions in Study 2 (*push my limits*) suggests that SSN may be most useful as an addition to the TPB, rather than a replacement of the SN.

In contrast, the other measures of social influence examined in this research (group norm and self identification) did not perform as strongly as the SSN. As such, it appears that the participants in this research are influenced more by the explicit pressure they perceive from their fellow riders (SSN), rather than what these riders actually do (group norm). Similarly, the findings relating to self identity are not inconsistent with those from other road safety studies. Evans and Norman (1998) found that self identity significantly predicted two of three road crossing intentions, but only accounted for an extra 3% variance above the standard TPB variables. Thus, while there may be some utility in including an assessment of self identity in future studies; this construct appears unlikely to be a strong predictor of road safety related behaviours.

The final theoretical contribution of this research was to examine how personality factors, such as sensation seeking and aggression, could further augment the TPB to improve the prediction of intentions and behaviour. Not surprisingly, these two variables did not significantly improve the prediction of the three 'safer' intentions in the Study 2. However, they did significantly predict all three 'riskier' intentions, accounting for an additional 6% - 7% of variance. In the case of intentions to *bend the road rules*, both sensation seeking and aggression were significant. However, with the other two risky intentions (*push my limits* and *perform stunts and/or ride at extreme speeds)*, only sensation seeking emerged as significant.

The role of the two personality factors was even more striking for the prediction of the self-reported behaviours. Together, these two variables accounted for between 7 – 20% of additional variance in the six behaviours. In particular, these two variables accounted for relatively large amounts of additional variance in the *ride while impaired* [R^2 ch = .20] and the *perform stunts and/or ride at extreme speeds* [R^2 ch = .15] variables. In the case of sensation seeking, these finding are consistent with much of the literature within traffic psychology linking this factor with a variety of risky driving practices (Jonah, 1997a, 1997b). However, the amount of unique variance accounted for by sensation seeking in Study 2 (around 2% - 6% for both intentions and behaviour) is somewhat low compared to Jonah's (1997a) assertion that it usually accounts for around 10-15% of the variance in risky driving. This may be due to the fact that sensation seeking and the propensity for aggression measures were entered together as a third step in the hierarchical regression model, after the TPB and other social influence variables had already been entered (thereby reducing the scope of the

variance that could be explained). In addition, it is possible that the results reflects a bias due to the high number of older participants in this study as sensation seeking tends to decrease with age (Zuckerman, 1994).

The results also highlight the need to further consider the role of aggression in motorcycle rider behaviour. As with sensation seeking, the propensity for aggressive riding proved a significant predictor of all six behaviours examined. However, the aggression measure proved a relatively stronger predictor than sensation seeking of the error-based behaviours (ie. *handling errors* and *awareness errors*), the *ride while impaired* behaviour, and the *perform stunts and/or ride at extreme speeds* behaviour. This suggests that the propensity to ride aggressively has a broader influence on rider behaviour, which is just not limited to the more volitional risk-taking types of behaviours. Consequently, this issue requires further investigation from both a theoretical and practical perspective.

5.3 Strengths and limitations of this research

This program of research featured a number of strengths. Firstly, it was firmly grounded in theory, utilising the TPB which has previously been shown to be highly effective in explaining road user intentions and behaviour, as well as other relevant concepts such as sensation seeking and aggression. Secondly, the program utilised both qualitative and quantitative methods, enabling a broader insight to be obtained into the factors influencing motorcycle rider behaviour. Thirdly, the design of the focus group and survey questionnaires was informed by input from active motorcyclists, from within both the research project team and the broader motorcycle community. Finally, the project attempted to adopt a more a more balanced approach to motorcycle safety by examining both safe and risky riding intentions and behaviour. In contrast, past research into both driver and motorcycle rider behaviour has tended to focus solely on risky behaviour.

Nonetheless, the program of research also had a number of limitations. Study 1 consisted of riders recruited from South East Queensland. Participants volunteered to take part in the study, and as such, these riders may be more interested in motorcycle safety than the general motorcycling population. Therefore, some of the views expressed in this study may not be representative of all Australian riders, especially as only two of the eight groups included riders under the age of 25 years. However, the sample did have a good gender balance and a variety of rider types (i.e., commuters, recreational riders, and people who ride as part of their employment). Also, the similarity of comments between this study and Krige's (1995a), which was conducted in NSW, suggests that many of the issues that were discussed in the focus groups captured on-going issues for Australian motorcyclists.

Similarly, the participants in Study 2 were primarily recruited from the South East corner of Queensland. Although it is known that some interstate riders completed the questionnaire, participants were not requested to provide any identifying information so the number of visiting riders wasn't recorded. There are known State and Territory differences in motorcycle use, with motorcycles registered in Queensland travelling more kilometres than any other State or Territory in Australia (Australian Bureau of Statistics, 2004a) so the findings of this study may not be transferable across the whole of Australia. Analysis of the quantitative survey suggests that this study sample may not even be representative of Queensland motorcyclists, but instead reflect a subset of older, primarily recreational, riders. Other Australian studies have had similar patterns of respondents (e.g., de Rome et al., 2002; Harrison & Christie, 2003), which suggests that targeted strategies may be required for the recruitment of younger or non-recreational motorcyclists for future studies. The literature indicates that young, inexperienced, riders are at the highest risk of serious injury and death from motorcycle crashes (Haworth, Smith et al., 1997; Mullin et al., 2000;

Rutter et al., 1995). Therefore, further research is necessary to obtain the views and opinions of young motorcyclists towards their safety and their approach to risk taking behaviour.

A number of other potential limitations in the Study 2 questionnaire design emerged during the analysis of the results. Firstly, there may have been some problems inherent in the operationalisation of the constructs: *refusing to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in any way* and *performing stunts and/or riding at extreme speeds.* Although the first item was designed to measure 'riding whilst impaired', people that ride tired are unlikely to be identical to those that drink and ride. Similarly, although the second item was intended to measure 'more extreme riding behaviour', people who ride at extreme speeds do not necessarily enjoy performing stunts. The word 'refuse' in the first item may also have led to some distortion of the results as it is possible very safe riders could state that they never refuse to ride impaired due to the fact that they would never get themselves into a situation where they would have to consider riding impaired. Secondly, no significant associations were found between the self-reported crashes of the participants and the various measure of intention and behaviour examined. It is possible that these intentions and behaviours do not have a close relationship with crash involvement. However, this conclusion does not seem consistent with either the findings of Study 1 or the research evidence reviewed in Chapter 2. More likely, the findings highlight shortcomings in the study's sample size and/or the way that crash involvement was measured (see section 4.5 for more discussion of this issue). Finally, it should be acknowledged that intentions and self-reported behaviour were measured at the same time in Study 2, raising potential causal ordering problems. A more valid test of the TPB would involve the measurement of intentions prior to behaviour.

5.4 Implications for motorcycle rider safety

One of the strengths of this study is that safer riding intentions and behaviour were examined with equal consideration to risky riding intentions. As the various intentions and behaviour examined were predicted by a different pattern of psychosocial, person-related, or demographic factors, different practical strategies may need to be adopted for addressing each type of behaviour. The results clearly show that safe and risky riding do not form a continuum, which may explain why many riders who engage in high risk riding behaviours consider themselves 'safe'. It is possible that riders who report safe riding intentions (i.e. *handling their motorcycle skilfully*, *maintaining 100% awareness*, *refusing to ride impaired*) also report risky riding intentions.

More generally, the program of research has highlighted a range of issues that need to be considered in the design of future training and education programs for motorcycle riders. Firstly, the fact that perceived behavioural control (PBC) significantly predicted four of the six intentions suggest a strong potential for training and education initiatives to improve rider safety, particularly for those behaviours which result from rider error, rather than deliberate risk taking behaviour. Rider training can be used to focus on the cognitive and physical skills necessary to improve a rider's ability to stay safe on the road (thereby improving intentions to *ride as safely as possible*, *handle my motorcycle skilfully*, *maintain 100% awareness*.) However, PBC was also positively associated with *pushing my limits*. This may mean that greater rider confidence may result in a greater intention to *push my limits*. The results of the qualitative study showed that the majority of riders enjoy pushing their limits, and that most riders considered that this could be done safely. Pushing one's limits may not be an intrinsically unsafe behaviour; however, most riders admit that their risk of crashing is raised under these conditions. It is possible that rider training may cause some riders to become overconfident in their abilities, resulting in a discrepancy between their perceived and actual limits. Therefore, rider training initiatives which improve a rider's skill may benefit from the addition of a personal education component which provides riders with higher-order planning, cognitive, and self monitoring skills. Preliminary work with young drivers has shown promise in this area (Bailey, 2005).

Secondly, the results of the research have highlighted a range of influences on intentions and behaviour that appear to be beyond the scope of current skills-based approaches to motorcycle training and education. For example, attitudinal and social factors, along with sensation seeking, emerged as significant predictors of rider intentions, particularly those of a 'risky' nature. Similarly, sensation seeking and a propensity for aggression (in addition to intentions) emerged as significant predictors of the six behaviours examined. In this regard, however, it has been argued that conventional rider training practices (like driver training) tend to focus on developing vehicle-handling skills and road rule knowledge and, as such, do not systematically address the attitudinal and motivational factors that influence rider behaviour (Watson et al, 1996; Haworth & Mulvihill, 2005).

Consequently, the results of this research highlight the need for motorcycle training and education programs to better address the attitudinal and motivational influences on riding, both of a personal and social nature. While it is highly unlikely that such programs will ever be able to directly modify more enduring personality factors, like sensation seeking, it may be feasible to raise the awareness of motorcyclists as to the influence of personal and social factors on their behaviour. For example, Bailey's (2005) study indicated that facilitated discussion can be used to broaden the scope of a person's thinking to encourage reflection on issues that they may not have previously considered within the context of their driving. Part of the personal education component of future rider training initiatives could use strategies such as facilitated discussion to address the wider social context of riding including issues such as maintaining personal control in the presence of other riders.

The program of research has also raised some interesting issues regarding the way that rider impairment is conceptualised and managed. In general, driver impairment tends to be recognised as an issue of concern within the community, irrespective of the source of impairment (i.e., whether it arises from alcohol or drug consumption, fatigue or another source). However, the motorcyclists participating in this research appeared to hold quite diverse views about the role of rider fatigue relative to other types of impairment. Some riders considered riding tired a hazard, whilst others reported that riding a motorcycle whilst fatigued was not problematic as the action of riding counteracts fatigue. Certainly, the physical challenge and open-air nature of riding a motorcycle may serve to temporarily reduce feelings of tiredness. It has been demonstrated that increased oxygen reduces an individual's subjective experience of fatigue quite quickly; however, physical reaction times may remain at lowered levels (Sung, Min, Kim & Kim, 2005). Therefore, dissemination of information about the impact of fatigue could be useful within the motorcycling community.

Finally, one of the key aims of this research program was to develop a Rider Risk Assessment Measure (RRAM), which would provide a measure of motorcyclists' intentions and self-reported on-road riding behaviour. As a result of Study 1, six key aspects of motorcycle rider behaviour were identified to form the basis of the RRAM: motorcycle handling; rider awareness; riding while impaired or not; bending the road rules; pushing limits; and riding at extreme speeds or performing stunts. These particular aspects of rider behaviour were selected to assess both 'safe' and 'risky' behaviour. Unfortunately, the resulting measures of rider intentions and behaviours tested in Study 2 did not prove to be significantly correlated to self-reported crash involvement. While this may reflect problems in the types of behaviours selected, it is more likely due to shortcomings in the way that crashes were measured. Moreover, a significant correlation was found between the majority of the behaviour measures and self-reported traffic offence involvement.

Further work is required to refine and validate the RRAM. Nonetheless, as it currently stands it represents a tool that can be used in a variety of ways in the motorcycle safety area. For example, it could be used in the initial phases of training programs to assess the characteristics of the participants, either to assist in raising awareness about different influences on riding or to assist in tailoring different types of educational messages. Similarly, it could be used as a tool for evaluating

changes in intentions and behaviour arising from participation in different types of training/education programs.

5.5 Suggestions for further research

A number of avenues for future research have been highlighted by this program of research. One of the major limitations of this research was the lack of young riders who participated in both studies. The focus group discussions revealed that friendly competition amongst riders may increase risk taking behaviour such as riding at speeds beyond their comfort level and performing stunts. The latter appeared particularly prevalent amongst young riders. This influence of a competitive environment on risk taking behaviour has also been found in other studies (e.g., Delhomme & Meyer, 1997). Anecdotally, many participants in the qualitative study expressed the view that the people they ride with influence their behaviour (either in a protective or risk-increasing way). The influence of the group, particularly on young riders, may be an important area for further research. It is possible that interventions which target the group riding phenomenon as well as individual safe riding may prove more effective than interventions which focus purely on improving an individual's skills. It would also be important to gather more solid information on the circumstances surrounding riding behaviour and crashes to determine how riding in groups acts as a protective factor and under what circumstances it may act as a risk factor.

Jessor's (1997) study into the risky driving behaviour of 18-25 year olds raised two important implications for road safety research into risk taking behaviour. First, the results of his study suggested that wider lifestyle (psychosocial, behavioural, and social role) issues may have an important influence on the success of interventions and should be more fully considered within road safety. Second, Jessor found that a reduction in risky driving is possible in even the most risky young drivers. Therefore, a study which explores the wider social and personal context of riders could be useful to inform future road safety initiatives in this area.

Another factor which may be usefully examined in future research is perceived risk. It has been suggested that there may be a link between the TPB construct of perceived behavioural control (PBC) and perceived risk, whereby behaviours which are easy to perform may be considered lower risk than those difficult to perform (Evans & Norman, 1998). While there was a moderate correlation between perceived risk and PBC in the Evans and Norman study, the addition of perceived risk to the regression analyses did not reduce the amount of variance explained by PBC. However, a significant negative relationship between sensation seeking and perceived risk was reported by Zuckerman (1979a). It would be interesting to examine whether perceived risk influences either safe or risky riding intentions. Further, as some participants in Study 1 suggested that they would push their limits in order to keep up with other riders, it may be worth examining whether, in cases such as these, a rider's perception of risk is directly influenced by the behaviour of others.

The relationship between future intentions and past crashes was not significant in this study. There is a need for prospective studies that are grounded in theory to examine the relationship between current intentions / behaviours and future crashes. Such studies will provide a theoretical basis for changing behaviours which are indicative of future crash risk. As the results of Study 2 indicate that safe and risky riding are not necessarily mutually exclusive, it would be useful to examine the crash risk of those riders who exhibit both safe and risky riding practices.

Off-road riding was not included in this study as approaches to studying and ultimately improving off-road riding are likely to vary significantly from strategies to improve on-road rider safety. Almost half of all serious motorcycle injuries occur off-road (Australian Transport Safety Bureau, 2004). Off-road motorcycle sales make up a larger proportion of new vehicle sales than on-road motorcycles, reflecting an increasing popularity of off-road recreational riding as well as a

significant number of work vehicles (such as motorcycles used in the agricultural industry) (Federal Chamber of Automotive Industries, 2005). Off-road motorcycle safety is an extremely important issue, although difficult to tackle due to the fact that riding occurs on private property or in State forests or parks. Another potential difficulty in accessing this population of riders is the number who ride unregistered motorcycles (and who may themselves be unlicensed). Industry estimates suggest that there may be as many as 350,000 unregistered motorcycles in Australia, the majority of these being off-road vehicles, as compared with 400,000 registered vehicles in 2004 (Federal Chamber of Automotive Industries, 2005). Off-road motorcycle riding is another area of motorcycle safety which requires further attention.

Another area of motorcycle safety which may require separate study relates to the, mainly urban, population of scooter riders. The design of scooters means that they handle differently to other motorcycles and they also attract a different type of rider. Scooter sales have experienced rapid growth in Australia since 2000, with at least 18 different brands now on the market, including some with engine capacities of over 500cc. In 2004, scooter sales made up 10% of all motorcycle sales (Federal Chamber of Automotive Industries, 2005). As these vehicles are already a major contributor to European motorcycle crashes (see MAIDS report), pre-emptive research in Australia would be prudent.

If the issue of motorcycle safety is to be seriously addressed, the attitudes and behaviours of other road users (in particular car drivers) should also be addressed. The literature indicates that a large proportion of motorcycle crashes result from errors made by other vehicles, and often drivers claim not to have seen the motorcyclist (Association of European Motorcycle Manufacturers, 2004; de Rome et al., 2002; Federal Office of Road Safety, 1999; Haworth, Smith et al., 1997; Preusser et al., 1995). Almost every rider interviewed mentioned instances of car drivers looking, but not seeing them; acting/reacting in a way that endangers them; or displaying deliberate, aggressive, behaviour.

Road construction and maintenance issues also need to be taken up with state and local government agencies. Most riders have experienced a crash or near miss due to poor road conditions. Australian investigations into motorcycle crashes have found road conditions to be a significant contributor to crashes (de Rome et al., 2002; Haworth, 1999); however, participants in this study argued that few road authorities are truly ‘motorcycle friendly’. An investigation into the barriers and instigators for change within state and local government would be useful.

5.6 Closing remarks

This program of research was designed to achieve three key aims:

- to develop a better understanding of the psychological and social influences on rider behaviour in an Australian context;
- to guide the development of future motorcycle safety countermeasures; and
- to develop a tool (the Rider Risk Assessment Measure – RRAM) to inform the evaluation of motorcycle safety countermeasures, particularly in the area of training and education.

While these aims have largely been achieved, the program of research has highlighted the need for further research and development in the area of motorcycle safety. Most importantly, it has identified a range of psychological and social influences on rider intentions and behaviour that appear to be beyond the scope of current skills-based approaches to motorcycle training and education. Consequently, further work is required to develop and trial new approaches to rider training and education that more effectively address the attitudinal and motivational influences on riding, both of a personal and social nature.

To assist in this process, this research has undertaken the first steps in the development of the Rider Risk Assessment Measure (RRAM). This tool is intended to act as a means of identifying high-risk riders by assessing their intentions and self-reported behaviour (in relation to both 'safe' and 'risky' riding). While further work is required to refine and validate the RRAM, it represents a tool that can be used in a variety of ways to enhance motorcycle safety countermeasures, including informing the design and content of training programs and evaluating the impact of different initiatives on rider behaviour.

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APPENDIX A – SCALES USED IN THE DATA ANALYSIS

Self Identity as a safe rider: 2 items [Cronbach's α = .73]

Measured on a 7-point Likert scale - Strongly Disagree to Strongly Agree.

- I am the sort of rider who rides safely at every opportunity
- I am the sort of rider who takes risks at every opportunity

Self Identity as a risky rider: 2 items [Cronbach's α = .69]

Measured on a 7-point Likert scale - Strongly Disagree to Strongly Agree.

- Being a rider who takes risks is an important part of who I am
- Being a safe rider is an important part of who I am

Sensation Seeking Scale: 8 items [Cronbach's α = .88]

(An adaptation of a driver thrill-seeking scale used by Stradling et al., 2004, pg. 180) Measured on a 7-point Likert scale - Strongly Disagree to Strongly Agree.

- I would enjoy riding a motorcycle on a road with no speed limit
- I enjoy the sensation of accelerating rapidly
- I enjoy taking risks on my motorcycle
- I get a real thrill out of riding fast
- I enjoy cornering at high speed
- I would like to be a professional motorcycle racer
- I like to raise my adrenaline levels while riding
- I sometimes like to frighten myself a little while riding

Propensity for aggression scale: 6 items [Cronbach's α = .72]

The three asterisked items are adapted from the Driver Behaviour Questionnaire (Reason et al., 1990). Measured on a 7-point Likert scale - Never to Always. Participants were asked to think about their riding on public roads in the last 12 months and asked how often they:

- Felt frustrated by other road users
- Felt angry and aggressive towards another road user
- Indicated your hostility towards another road user by whatever means you could*
- Gave chase when angered by another rider or road user*
- Physically attacked another vehicle or rider/driver when angered
- Ridden especially close to the car in front as a signal to its driver to go faster or get out of the way*

Behaviour Scales

Measured on a 7-point Likert scale, Never to Always. Participants were asked to think about their riding on public roads in the last 12 months and asked how often they had performed these behaviours. Some items are acknowledged as being adapted from, or conceptually inspired by, existing measures; however, most of the items evolved from the analysis of Study 1.

Items marked with a:

are from, or inspired by Elliott, Sexton and Keating (2003); and

^ are from Watson et al., (2003).

Handling errors: 10 items [Cronbach's α = .74]

- Followed another rider overtaking and found you didn't have quite as much room as you thought
- Almost lost control while cornering
- Had the motorcycle lunge forward because you accidentally dropped the clutch too quickly
- Braked too hard and locked up a back wheel
- Braked too hard and locked up a front wheel
- Found that you had difficulty controlling the motorcycle when manoeuvring at very slow speeds
- Failed to stay strictly in your lane when going around a multi-lane roundabout
- Failed to cancel your indicator after turning or changing lanes
- Failed to shoulder check before changing lanes
- Almost collide with someone you are riding with
- Failed to cancel your indicator after turning or changing lanes

Awareness (of the traffic and surrounding road environment) errors: 11 items [Cronbach's α = .81]

- Pulled out on to a main road in front of a vehicle that you hadn't noticed, or whose speed you misjudged#
- Failed to notice another vehicle pulling out in front of you and then had difficulty stopping#
- Attempted to overtake someone that you hadn't noticed to be signalling a right turn#
- Failed to notice a pedestrian who was crossing in front of you or stepping out from behind a parked car until it was nearly too late#
- Needed to brake urgently to avoid rear-ending the vehicle stopping in front of you#
- Travelled through a stop or give way sign and almost crashed with another vehicle#
- Realised you have misjudged the speed of oncoming traffic as you overtook
- Taken off at traffic lights without looking for vehicles who may be running a red light

- Found yourself not concentrating and nearly had a crash
- Failed to provide enough notice (using your indicators) that you were about to turn or change lanes
- Follow the rider in front of you and find yourself just following them rather than riding your own ride

Ridden while impaired: 5 items [Cronbach's α = .60]

- Ridden when you were or might have been over the legal blood alcohol limit#
- Ridden when you might have had any alcohol in your system
- Ridden after using marijuana or any other illicit drug
- Ridden when you were tired^
- Allowed your mood to influence your riding in an unsafe way

Bend road rules to get through traffic: 8 items [Cronbach's α = .87]

- Bent some road rules in order to get ahead in traffic
- Ridden between two lanes of stationary traffic^
- Gone up the inside shoulder to get through traffic
- Frequently changed lanes to get ahead of traffic
- Raced away from the traffic lights with the intention of getting ahead of the traffic
- Exceeded the posted speed limit
- Ridden over the speed limit in a 40kph school zone during school hours
- Ridden through a red light when there was no traffic coming

Push the limits: 9 items [Cronbach's α = .82]

- Race your riding friends
- Pushed yourself and /or the bike until the handling became unpredictable
- Pushed your limits too far and 'came off'
- Practiced taking corners the way that racers do
- Raced strangers on motorcycles or other road users#
- Attempted to keep up with other riders or traffic travelling faster than you
- Tried to break your own speed record
- Ride too fast to show others you can handle your motorcycle
- Take some risks, you wouldn't normally take, to stay with the group

Perform stunts and/or ride at extreme speeds 7 items [Cronbach's α = .79]:

- Rode recklessly or performed dangerous stunts to test your abilities
- Attempted to do, or actually did, a wheelie or stoppie
- Ridden up in between two lanes of fast moving traffic#
- Ridden 15kph or more over the speed limit in 50kph or 60kph zones
- Ridden 25kph or more over the speed limit in zones that are 100kph or higher
- Ridden too fast for the conditions

APPENDIX B: BIVARIATE CORRELATIONS OF SUBJECTIVE NORM AND SPECIFIC SUBJECTIVE NORM

The relevant correlations run diagonally and are shaded.

Table 12. Bivariate correlations between SN and SSN

		Subjective Norm					
Specific subjective norm		Handling	100% aware	Bending rules	Not if impaired	Pushing limits	Stunts or speed
Handling	Pearson Correlation	.161*	.107	-.190**	.052	-.060	-.085
	N	196	195	195	194	195	195
100% aware	Pearson Correlation	.078	.079	-.146*	.017	-.004	-.059
	N	194	193	193	192	193	193
Bending rules	Pearson Correlation	-.116	-.147*	.392**	.006	.356**	.257**
	N	196	195	195	194	195	195
Not if impaired	Pearson Correlation	-.039	-.061	.009	.314**	-.021	-.008
	N	195	195	195	194	195	195
Pushing limits	Pearson Correlation	-.109	-.122	.183*	-.080	.334**	.260**
	N	195	195	195	194	195	195
Sunts or speed	Pearson Correlation	-.125	-.136	.026	-.167*	.173*	.272**
	N	195	195	195	194	195	195

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

APPENDIX C: BIVARIATE CORRELATIONS BETWEEN CRASH HISTORY OVER THE PAST TWO YEARS AND OTHER STUDY VARIABLES

A non-paramentric correlation analysis (Spearman's Rank Order) was undertaken due to the fact that 75% of riders had not crashed in the past two years, which created uneven cell sizes. A total of 45 participants reported being involved in one crash, 8 reported they had crashed twice, and 4 stated they had been involved in three crashes.

Table 13. Results of the bivariate correlations showing the relationship between the number of crashes in the past two years and attitude, SN, PBC, SSN, GN, self identification, SS, aggression, age, gender, average hours ridden, behavioural intentions and self-reported behaviour

Spearman's rank-order correlation	*n*	Crashes
Attitude		
handling	224	-.01
100% aware	224	-.09
not if impaired	223	-.18**
bending rules	224	.01
pushing limits	224	-.04
perform stunts	224	-.02
Subjective Norm		
handling	225	-.03
100% aware	224	-.12
not if impaired	223	-.02
bending rules	224	-.12
pushing limits	224	-.09
perform stunts	224	-.04
Perceived Behavioural Control		
handling	224	-.12
100% aware	225	-.10
not if impaired	224	-.09
bending rules	225	-.06
pushing limits	225	-.12
perform stunts	225	-.14*
Specific Subjective Norm		
handling	194	.06

100% aware	192	.05
not if impaired	193	-.04
bending rules	194	.05
pushing limits	193	.00
perform stunts	193	.10
Group Norm		
handling	196	.01
100% aware	195	-.10
not if impaired	193	-.07
bending rules	196	.08
pushing limits	194	.02
perform stunts	195	.03
Other Factors		
Self ID safe rider	227	.03
Self ID risky rider	227	.05
Sensation seeking	227	-.02
Age in 2005	224	-.03
Gender	225	-.01
Hours on road pw	222	.10
Intentions		
handling	223	-.01
100% aware	223	-.03
not if impaired	223	-.13
bending rules	223	.01
pushing limits	223	-.05
perform stunts	223	-.05
Self-reported behaviour		
handling errors	226	.13
awareness errors	226	.12
riding impaired	226	.06
bending rules	226	.06
pushing limits	226	.05
performing stunts	225	-.01
total behaviours	225	.07

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

APPENDIX D: BIVARIATE CORRELATIONS BETWEEN OFFENCE HISTORY OVER THE PAST TWO YEARS AND OTHER STUDY VARIABLES

A non-paramentric correlation analysis (Spearman's Rank Order) was undertaken due to the fact that 56% of the participants reported that they had not been convicted of a traffic offence in the past two years, which created uneven cell sizes. A total of 63 participants reported being convicted of one offence, 22 reported two offences, 8 reported three offences, 4 reported four, 3 indicated five traffic offences and one reported being convicted six times in the past two years.

Table 14. Results of the bivariate correlations showing the relationship between the number of traffic offences over the past two years and attitude, SN, PBC, SSN, GN, self identification, SS, aggression, age, gender, average hours ridden, behavioural intentions and self-reported behaviour

Spearman's rank-order correlation	***n***	**Offences**
Attitude		
handling	224	-.06
100% aware	224	-.08
not if impaired	223	-.12
bending rules	224	.13*
pushing limits	224	.17*
perform stunts	224	.09
Subjective Norm		
handling	225	-.09
100% aware	224	-.01
not if impaired	223	-.12
bending rules	224	.10
pushing limits	224	.17*
perform stunts	224	.07
Perceived Behavioural Control		
handling	224	-.01
100% aware	225	-.02
not if impaired	224	-.03
bending rules	225	-.10
pushing limits	225	-.02
perform stunts	225	-.03
Specific Subjective Norm		

handling	195	-.09
100% aware	193	-.03
not if impaired	194	-.06
bending rules	195	.19**
pushing limits	194	.16*
perform stunts	194	.09
Group Norm		
handling	197	.01
100% aware	196	-.01
not if impaired	194	.01
bending rules	197	.15*
pushing limits	195	.14
perform stunts	196	.10
Other Factors		
Self ID safe rider	227	-.17*
Self ID risky rider	227	.20**
Sensation seeking	227	.23**
Age in 2005	224	-.09
Gender	225	-.03
Hours on road pw	221	-.02
Intentions		
handling	223	-.07
100% aware	223	-.04
not if impaired	223	-.06
bending rules	223	.17*
pushing limits	223	.16*
perform stunts	223	.14*
Self-reported behaviour		
handling errors	227	.18**
awareness errors	227	.12
riding impaired	227	.24***
bending rules	227	.28***
pushing limits	227	.25***
performing stunts	226	.27***
Total behaviours	226	.30***

*** Correlation is significant at the 0.001 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

APPENDIX E: STUDY 2 QUESTIONNAIRE

CARRS Centre for Accident Research & Road Safety - Queensland (CARRS-Q)

ABN: 83 791 724 622

Motorcycle Rider Questionnaire

What is this project about?

The QUT Centre for Accident Research and Road Safety – Queensland (CARRS-Q) is undertaking research into the factors which influence the safety of motorcyclists. We are interested in finding out what affects rider behaviour in both safe and unsafe ways.

This questionnaire has been developed by motorcyclists, for motorcyclists. We have talked to lots of people about safe and unsafe behaviours and have used these discussions to develop this survey.

What will my answers be used for?

This research will be used to assist in the design of motorcycle safety programs, particularly in the area of rider training. Our goal is to reduce the involvement of motorcyclists in road crashes.

This is an anonymous questionnaire so we do not want to know your name or any contact details.

What are we asking you to do?

We are asking you to complete the Motorcycle Rider Questionnaire, and that you answer all questions honestly. There are no 'right' or 'wrong' answers as we understand that every motorcyclist has different riding abilities, experience, and opinions.

Please try to answer all the questions, however if there is a question you don't understand, or feel uncomfortable about, just leave it and move onto the next question.

Your participation in this survey is voluntary. If you start to fill out the questionnaire but then decide you do not wish to continue, you can stop at any time.

Where can I find out more?

If you have any questions about this research, you can contact Deborah Tunnicliff (email d.tunnicliff@qut.edu.au or telephone 3864-4749) or Dr Barry Watson (3864 4955).

If you have any concerns about the ethical conduct of this research, please contact the University Research Ethics Officer on 3864-2340 or ethicscontact@qut.edu.au

Thank you for your time in completing this questionnaire.

Please tear off this page to keep for your future reference.

QUT CARRS-Q is a joint venture initiative of the Motor Accident Insurance Commission and Queensland University of Technology
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INSTRUCTIONS

For each of the questions please select the answer which best reflects your views and/or experiences.

On the first page (your background and riding experience), please indicate your answer by ticking the boxes or writing in the space provided.

For the rest of the questionnaire, please select the answer by circling the number that corresponds most closely to your opinion or by writing your answer in the space provided.

Some of the questions may seem to be very similar, but they are different and we would like you to answer all of them if possible

At any stage if you want to give us extra information, please write in the margin or on the back of the page.

To ensure your confidentiality and anonymity all questionnaires are returned directly to researchers at QUT. **Please do not put your name on the questionnaire.**

Please try to return your questionnaire in the reply paid envelope within the next two (2) weeks.

Thank you so much for your help

MOTORCYCLE RIDER QUESTIONNAIRE

This section just tells us a little bit about your background and riding experience.

Please tick the boxes that best describe you:

Gender	**Age**	**Marital status (tick one)**	**Children (tick whichever apply)**
☐ Male	I was born in:	☐ Single	☐ Have children aged under 16
☐ Female	19 ___ ___	☐ Married / de facto	☐ Have children aged 16 or older
		☐ Separated, divorced, widowed	☐ Have no children

Motorcycle licence (tick one)	**Car licence (tick one)**	**Other on-road vehicle licences (tick one)**
☐ I have a learner motorcycle licence	☐ I have a learner licence	☐ I have a licence to drive a truck or bus
☐ I have a RE Licence (maximum 250cc)	☐ I have a provisional licence	☐ My truck or bus licence is disqualified, suspended or expired
☐ I have a R Licence (open motorcycle)	☐ I have an open licence	☐ I have never held one of these licences
☐ My motorcycle licence is disqualified, suspended or expired	☐ My car licence is disqualified, suspended or expired	
☐ I have never held a motorcycle licence	☐ I have never held a car licence	

Lifetime riding experience	**Professional rider training (tick all that apply)**
How many years have you been riding? (Please include all riding, both on and off road, but don't count long breaks) _____ years or _____ months	☐ I have completed a Q-Ride course ☐ I have received other professional rider training ☐ I have had no professional rider training
Hours on the road	**Riding frequency (tick one)**
Approximately how many hours per week do you ride on public roads? Please don't count rest stops or times you are a pillion. _____ total hours per average week. Of these, how many hours are on weekends? _____ and how many would be after dark? _____	On average, how often have you been riding on-road, over the past 12 months? ☐ Once a month or less ☐ 2-3 times per month ☐ Once or twice a week ☐ At least 3 times per week ☐ Daily or almost daily
Type of motorcycle (tick one)	**Disability/injury (tick one)**
What style of motorcycle have you ridden most on-road in the past 12 months? ☐ Sports ☐ Sports-Tourer ☐ Tourer ☐ Cruiser ☐ Chopper Other (please describe) _____	Do you have a permanent disability or injury from a motorcycle crash? ☐ No ☐ Yes, within the past 2 years ☐ Yes, within the past 2- 5 years ☐ Yes, within the past 5-10 years ☐ Yes, over ten years ago

Q1. **Thinking about your riding on public roads in the last 12 months, how much do you agree or disagree with each of these statements:**

(Please circle a number from 1 to 7 which best reflects your thoughts.)

Please circle one number in each row

	Strongly Disagree						**Strongly Agree**
I am the sort of rider who rides safely at every opportunity	1	2	3	4	5	6	7
It is more important to wear protective clothing on long trips than short trips	1	2	3	4	5	6	7
I have strong ties to other motorcyclists in general	1	2	3	4	5	6	7
You don't have to be a skilled rider to be a safe rider	1	2	3	4	5	6	7
I wear protective clothing because I am vulnerable on my motorcycle	1	2	3	4	5	6	7
I wear protective clothing because it makes it safer to push my limits	1	2	3	4	5	6	7
Being a rider who takes risks is an important part of who I am	1	2	3	4	5	6	7
If I dropped or damaged my helmet I would not ride at all until I got a new one	1	2	3	4	5	6	7
I won't allow a pillion on my motorcycle unless they have at least as much protective clothing as I have	1	2	3	4	5	6	7
I feel I fit in with other motorcyclists in general	1	2	3	4	5	6	7
I am the sort of rider who takes risks at every opportunity	1	2	3	4	5	6	7
I don't wear all my protective clothing if it is too hot	1	2	3	4	5	6	7
Being a safe rider is an important part of who I am	1	2	3	4	5	6	7

Q2. **Thinking about your riding on public roads in the last 12 months, how often have you ridden:**

(Please circle a number from 1 to 7 which best reflects your riding habits.)

Please circle one number in each row

	Never						**Always**
Alone	1	2	3	4	5	6	7
With one other person who **does not** compete with you	1	2	3	4	5	6	7
With one other person who **does** compete with you	1	2	3	4	5	6	7
In a group **without any** competitive riders in it	1	2	3	4	5	6	7
In a group **with some** riders who like to compete with you or others in the group	1	2	3	4	5	6	7

Q3. **If you have ridden with anyone over the past 12 months, please circle a number from 1 to 7 which best shows how you feel about the people you ride with:**

If you have not ridden with anyone over the past 12 months, **GO TO Q5.**

Please circle one number in each row

	Strongly Disagree						**Strongly Agree**
I have strong ties to the people I ride with	1	2	3	4	5	6	7
I feel I fit in with the people I ride with	1	2	3	4	5	6	7

Q4. **If you ever ride in a group or with another person, how often do the following apply?** If you never ride with anyone else please go to **Q5**. *(Please circle a number from 1 to 7 which best reflects your riding habits)*	Please circle one number in each row **Never**						**Always**
Follow the rider in front of you and find yourself just following them rather than riding your own ride?	1	2	3	4	5	6	7
Ride in a group (or with another rider) which includes people who ride in a way that might endanger you	1	2	3	4	5	6	7
Adjust your riding style to allow for the experience and skill level of others in the group	1	2	3	4	5	6	7
Ride too fast to show others you can handle your motorcycle	1	2	3	4	5	6	7
Failed to notice a potential traffic hazard because you are riding in a group or with another rider	1	2	3	4	5	6	7
Race your riding friends	1	2	3	4	5	6	7
Fall behind if other riders are pushing it harder than you think is safe	1	2	3	4	5	6	7
Almost collide with someone you are riding with	1	2	3	4	5	6	7
Take some risks, you wouldn't normally take, to stay with the group	1	2	3	4	5	6	7

Q5. **These questions are all about how you feel when you are riding.** *(Please circle a number from 1 to 7 to show your answers)*	Please circle one number in each row **Strongly Disagree**						**Strongly Agree**
I would enjoy riding a motorcycle on a road with no speed limit	1	2	3	4	5	6	7
I enjoy the sensation of accelerating rapidly	1	2	3	4	5	6	7
I enjoy taking risks on my motorcycle	1	2	3	4	5	6	7
I get a real thrill out of riding fast	1	2	3	4	5	6	7
I enjoy cornering at high speed	1	2	3	4	5	6	7
I would like to be a professional motorcycle racer	1	2	3	4	5	6	7
I like to raise my adrenaline levels while riding	1	2	3	4	5	6	7
I sometimes like to frighten myself a little while riding	1	2	3	4	5	6	7

Q6. **When you've been riding on-road over the past 12 months, how often have you:** *(Circle a number from 1 to 7 to show how often you have done these things)*	Please circle one number in each row **Never**						**Always**
Pulled out on to a main road in front of a vehicle that you hadn't noticed, or whose speed you misjudged	1	2	3	4	5	6	7
Failed to notice another vehicle pulling out in front of you and then had difficulty stopping	1	2	3	4	5	6	7
Attempted to overtake someone that you hadn't noticed to be signalling a right turn	1	2	3	4	5	6	7
Failed to notice a pedestrian who was crossing in front of you or stepping out from behind a parked car until it was nearly too late	1	2	3	4	5	6	7

Q6 cont. When you've been riding on-road over the past 12 months, how often have you: *(Circle a number from 1 to 7 to show how often you have done these things)*	Please circle one number in each row **Never**						**Always**
Needed to brake urgently to avoid rear-ending the vehicle stopping in front of you	1	2	3	4	5	6	7
Travelled through a stop or give way sign and almost crashed with another vehicle	1	2	3	4	5	6	7
Realised you have misjudged the speed of oncoming traffic as you overtook	1	2	3	4	5	6	7
Taken off at traffic lights without looking for vehicles who may be running a red light	1	2	3	4	5	6	7
Followed another rider overtaking and found you didn't have quite as much room as you thought	1	2	3	4	5	6	7
Almost lost control while cornering	1	2	3	4	5	6	7
Had the motorcycle lunge forward because you accidentally dropped the clutch too quickly	1	2	3	4	5	6	7
Braked too hard and locked up a back wheel	1	2	3	4	5	6	7
Braked too hard and locked up a front wheel	1	2	3	4	5	6	7
Found that you had difficulty controlling the motorcycle when manoeuvring at very slow speeds	1	2	3	4	5	6	7
Failed to stay strictly in your lane when going around a multi-lane roundabout	1	2	3	4	5	6	7
Found yourself not concentrating and nearly had a crash	1	2	3	4	5	6	7
Failed to provide enough notice (using your indicators) that you were about to turn or change lanes	1	2	3	4	5	6	7
Failed to cancel your indicator after turning or changing lanes	1	2	3	4	5	6	7
Failed to shoulder check before changing lanes	1	2	3	4	5	6	7
Ridden up in between two lanes of fast moving traffic	1	2	3	4	5	6	7
Ridden between two lanes of stationary traffic	1	2	3	4	5	6	7
Gone up the inside shoulder to get through traffic	1	2	3	4	5	6	7
Frequently changed lanes to get ahead of traffic	1	2	3	4	5	6	7
Raced away from the traffic lights with the intention of getting ahead of the traffic	1	2	3	4	5	6	7
Exceeded the posted speed limit	1	2	3	4	5	6	7
Ridden 15kph or more over the speed limit in 50kph or 60kph zones	1	2	3	4	5	6	7
Ridden over the speed limit in a 40kph school zone during school hours	1	2	3	4	5	6	7
Ridden 25kph or more over the speed limit in zones that are 100kph or higher	1	2	3	4	5	6	7
Ridden too fast for the conditions	1	2	3	4	5	6	7
Bent some road rules in order to get ahead in traffic	1	2	3	4	5	6	7

Q6 cont. When you've been riding on-road over the past 12 months, how often have you? *(Circle a number from 1 to 7 to show how often you have done these things)*	Please circle one number in each row **Never**						**Always**
Checked your tyres for wear, pressure, or nails etc. before you rode	1	2	3	4	5	6	7
Left a 2 second gap between you and the vehicle in front (at all speeds)	1	2	3	4	5	6	7
Backed off when another vehicle wanted to move into your lane	1	2	3	4	5	6	7
Got a gut feeling telling you to ease off and payed attention to it	1	2	3	4	5	6	7
Ridden when you were or might have been over the legal blood alcohol limit	1	2	3	4	5	6	7
Ridden when you might have had any alcohol in your system	1	2	3	4	5	6	7
Ridden after using marijuana or any other illicit drug	1	2	3	4	5	6	7
Ridden when you were tired	1	2	3	4	5	6	7
Ridden through a red light when there was no traffic coming	1	2	3	4	5	6	7
Allowed your mood to influence your riding in an unsafe way	1	2	3	4	5	6	7
Pushed yourself and /or the bike until the handling became unpredictable	1	2	3	4	5	6	7
Pushed your limits too far and 'came off'	1	2	3	4	5	6	7
Practiced taking corners the way that racers do	1	2	3	4	5	6	7
Raced strangers on motorcycles or other road users	1	2	3	4	5	6	7
Attempted to keep up with other riders or traffic travelling faster than you	1	2	3	4	5	6	7
Attempted to do, or actually did, a wheelie or stoppie	1	2	3	4	5	6	7
Tried to break your own speed record	1	2	3	4	5	6	7
Rode recklessly or performed dangerous stunts to test your abilities	1	2	3	4	5	6	7
Felt frustrated by other road users	1	2	3	4	5	6	7
Felt angry and aggressive towards another road user	1	2	3	4	5	6	7
Indicated your hostility towards another road user by whatever means you could	1	2	3	4	5	6	7
Gave chase when angered by another rider or road user	1	2	3	4	5	6	7
Physically attacked another vehicle or rider/driver when angered	1	2	3	4	5	6	7
Ridden especially close to the car in front as a signal to its driver to go faster or get out of the way	1	2	3	4	5	6	7
Worn a motorcycle jacket on short trips (e.g. to the local shops)	1	2	3	4	5	6	7
Worn a motorcycle jacket on long trips	1	2	3	4	5	6	7
Adjusted to a safer riding style out of consideration for other road users	1	2	3	4	5	6	7
Adjusted to a safer riding style because you thought about the effect on your family and friends if you were seriously injured	1	2	3	4	5	6	7
Adjusted to a safer riding style because you thought about losing your licence or being fined	1	2	3	4	5	6	7

An **injury crash** is an incident which resulted in an injury
to **you or someone else** that needed **medical attention** (doctor or hospital)

Q7a. How many times have you had an injury crash on a motorcycle, on a public road in the past two years?

_____ injury crashes ☐ None **PLEASE GO TO Q8a**

Q7b. If you have had one or more injury crashes, how many times did the following occur :

No other vehicle was involved at all	_____ times
Another motorcycle (riding with you) contributed to the crash	_____ times
Another motorcycle (not riding with you) contributed to the crash	_____ times
Another vehicle (not a motorcycle) contributed to the crash	_____ times
A pillion passenger contributed to the crash	_____ times
You were charged by the police over the crash	_____ times
The crash was mainly someone else's fault	_____ times

A **non-injury crash** is an incident where no one needed medical attention,
but there was **serious damage to your motorcycle or another vehicle**

Q8a. How many times have you had a non-injury crash on a motorcycle on a public road in the past two years?

_____ non-injury crashes ☐ None **PLEASE GO TO Q9**

Q8b. If you have had one or more non-injury crashes, how many times did the following occur:

No other vehicle involved at all	_____ times
Another motorcycle (riding with you) contributed to the crash	_____ times
Another motorcycle (not riding with you) contributed to the crash	_____ times
Another vehicle (not a motorcycle) contributed to the crash	_____ times
Pillion passenger contributed to the crash	_____ times
You were charged by the police over the crash	_____ times
The crash was mainly someone else's fault	_____ times

Q9. Over the past 2 years, how many times have you been booked by the police for: (If never booked, please enter "0")	**Motorcycle**	**Car / Truck /Bus**
Speeding	_____ times	_____ times
Failing to give way at GIVE WAY sign or stop at a STOP sign	_____ times	_____ times
Failing to stop at red light (or red light camera offence)	_____ times	_____ times
Riding over the legal limit of blood alcohol concentration (BAC)	_____ times	_____ times
Riding without a valid licence	_____ times	_____ times
Other please describe ( )	_____ times	_____ times

Thinking about ALL your on-road riding over the next 12 months.

By "ALL your riding" we mean every time you ride on public roads over the next 12 months.

Q10. Please circle one number in each row to show how much you agree or disagree with each of the following statements.	**Strongly Disagree**						**Strongly Agree**
Riding as safely as possible **is important to me** *(e.g. staying strictly in your lane, careful traffic scanning, maintaining a safe following distance, not pushing your limits)*	1	2	3	4	5	6	7
Handling my motorcycle skilfully **is important to me**	1	2	3	4	5	6	7
Always being 100% aware of the traffic and surrounding road environment **is important to me**	1	2	3	4	5	6	7
Bending road rules to get through traffic **is important to me**	1	2	3	4	5	6	7
Refusing to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in any way **is important to me**	1	2	3	4	5	6	7
Pushing my limits **is important to me**	1	2	3	4	5	6	7
Performing stunts and/or riding at extreme speeds **is important to me**	1	2	3	4	5	6	7

Q11. Please circle one number in each row to show how much you agree or disagree with each of the following statements.	**Strongly Disagree**						**Strongly Agree**
Whether or not I ride as safely as possible **is completely within my control** *(e.g. staying strictly in your lane, careful traffic scanning, maintaining a safe following distance, not pushing your limits)*	1	2	3	4	5	6	7
Whether or not I handle my motorcycle skilfully **is completely within my control**	1	2	3	4	5	6	7
Whether or not I am always 100% aware of the traffic and surrounding road environment **is completely within my control**	1	2	3	4	5	6	7
Whether or not I bend road rules to get through traffic **is completely within my control**	1	2	3	4	5	6	7
Whether or not I refuse to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in any way **is completely within my control**	1	2	3	4	5	6	7
Whether or not I push my limits **is completely within my control**	1	2	3	4	5	6	7
Whether or not I perform stunts and/or riding at extreme speeds **is completely within my control**	1	2	3	4	5	6	7

Now, thinking about the people you ride with and ALL the on-road riding they will do over the next 12 months.

☐ I never ride with anyone **PLEASE GO TO Q13.**

Q12. Please circle one number in each row to show how much you agree or disagree with each of the following statements.	**Strongly Disagree**						**Strongly Agree**
The people I ride with would ride as safely as possible *(e.g. staying strictly in their lane, careful traffic scanning, maintaining a safe following distance, not pushing their limits)*	1	2	3	4	5	6	7
The people I ride with would handle their motorcycle(s) skilfully	1	2	3	4	5	6	7
The people I ride with would always be 100% aware of the traffic and surrounding road environment	1	2	3	4	5	6	7
The people I ride with would bend road rules to get through traffic	1	2	3	4	5	6	7
The people I ride with would refuse to ride if they are tired, affected by drugs or alcohol, or their judgement is impaired in any way	1	2	3	4	5	6	7
The people I ride with would push their limits	1	2	3	4	5	6	7
The people I ride with would perform stunts and/or ride at extreme speeds	1	2	3	4	5	6	7

Thinking about ALL your riding over the next 12 months:

Q13. Please circle one number in each row to show how much you agree or disagree with each of the following statements.	**Strongly Disagree**						**Strongly Agree**
Most people who are important to me would want me to ride as safely as possible *(e.g. staying strictly in your lane, careful traffic scanning, maintaining a safe following distance, not pushing your limits)*	1	2	3	4	5	6	7
Most people who are important to me would want me to handle my motorcycle skilfully	1	2	3	4	5	6	7
Most people who are important to me would want me to always be 100% aware of the traffic and surrounding road environment	1	2	3	4	5	6	7
Most people who are important to me would want me to bend road rules to get through traffic	1	2	3	4	5	6	7
Most people who are important to me would want me to refuse to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in any way	1	2	3	4	5	6	7
Most people who are important to me would want me to push my limits	1	2	3	4	5	6	7
Most people who are important to me would want me to perform stunts and/or ride at extreme speeds	1	2	3	4	5	6	7

The questions on this page are about ALL your riding over the next 12 months.

☐ I never ride with anyone **PLEASE GO TO Q15.**

Q14. Please circle one number in each row to show how much you agree or disagree with each of the following statements.	**Strongly Disagree**						**Strongly Agree**
The people I ride with would want me to ride as safely as possible *(e.g. staying strictly in your lane, careful traffic scanning, maintaining a safe following distance, not pushing your limits)*	1	2	3	4	5	6	7
The people I ride with would want me to handle my motorcycle skilfully	1	2	3	4	5	6	7
The people I ride with would want me to always be 100% aware of the traffic and surrounding road environment	1	2	3	4	5	6	7
The people I ride with would want me to bend road rules to get through traffic	1	2	3	4	5	6	7
The people I ride with would want me to refuse to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in any way	1	2	3	4	5	6	7
The people I ride with would want me to push my limits	1	2	3	4	5	6	7
The people I ride with would want me to perform stunts and/or ride at extreme speeds	1	2	3	4	5	6	7

Q15. Please circle one number in each row to show how much you agree or disagree with each of the following statements.	**Strongly Disagree**						**Strongly Agree**
It is likely that I will ride as safely as possible *(e.g. staying strictly in your lane, careful traffic scanning, maintaining a safe following distance, not pushing your limits)*	1	2	3	4	5	6	7
It is likely that I will handle my motorcycle skilfully	1	2	3	4	5	6	7
It is likely that I will always be 100% aware of the traffic and surrounding road environment	1	2	3	4	5	6	7
It is likely that I will bend road rules to get through traffic	1	2	3	4	5	6	7
It is likely that I will refuse to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in any way	1	2	3	4	5	6	7
It is likely that I will push my limits	1	2	3	4	5	6	7
It is likely that I will perform stunts and/or ride at extreme speeds	1	2	3	4	5	6	7

Q16. Finally we would like to ask you about what you think are the main issues/problems or areas we should focus on for rider training. *(Please write in your comment - use the back of this survey if you run out of space)*

_____

_____

_____

_____

Thankyou for your time and patience – it is very much appreciated