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RUNNING HEAD: Motorcycle rider intentions

Understanding the factors influencing safe and unsafe motorcycle rider intentions

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Abstract

The increasing popularity of motorcycles in Australia is a significant concern as motorcycle riders represent 15% of all road fatalities and an even greater proportion of serious injuries. This study assessed the psychosocial factors influencing motorcycle riders' intentions to perform both safe and risky riding behaviours. Using an extended theory of planned behaviour (TPB), motorcycle riders (N = 229) from Queensland, Australia were surveyed to assess their riding attitudes, subjective norm (general and specific), perceived behavioural control (PBC), group norm, self-identity, sensation seeking, and aggression, as well as their intentions, in relation to three safe (e.g., handle my motorcycle skilfully) and three risky (e.g., bend road rules to get through traffic) riding behaviours. Although there was variability in the predictors of intention across the behaviours, results revealed that safer rider intentions were most consistently predicted by PBC, while riskier intentions were predicted by attitudes and sensation seeking. The TPB was able to explain a greater proportion of the variance for intentions to perform risky behaviours. Overall, this study has provided insight into the complexity of factors contributing to rider intentions and suggests that different practical strategies need to be adopted to facilitate safer and reduce risky rider decisions.

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1 Introduction

The increase in motorcycle sales and popularity in recent years corresponds to a rising number of fatalities on Australian roads (Australian Bureau of Statistics, 2009; Motorcycle Safety Consultative Committee, 2009). In the period 1998-2007, motorcyclist deaths in Australia continued to increase compared to static numbers of driver deaths and a reduction in the number of pedestrian deaths (Johnston et al., 2008). Indeed, motorcycle riders represented approximately 15% of all fatalities on Australian roads and an even greater proportion of serious injuries (Johnston et al., 2008). Australia rates relatively poorly, compared to other Organisation for Economic Co-operation and Development countries, when motorcyclist fatalities are considered (Australian Transport Safety Bureau, 2000; 2003). This research was motivated by the urgent need to address the safety of motorcyclists on Australian roads.

A range of modifiable behaviours may contribute to motorcycle crashes and injuries including riding speed (Horswill and Helman, 2003; Lin and Kraus, 2009), traffic errors (e.g., being distracted or pre-occupied resulting in a near collision), control errors (e.g., trouble handling the bike) (Elliott et al., 2007), alcohol and/or drug use (Haworth et al., 1997; Lin and Kraus, 2009), and risk-taking (e.g., driving with too little headway) (Lin and Kraus, 2009; Sexton et al., 2004). While identifying the behaviours that contribute to motorcycle crashes assists in the development of initiatives to reduce crashes, there has been little research about the motivations underlying motorcycle riders' choices to engage in these behaviours (Elliott, 2010). The use of decision-making theories can play a pivotal role in explaining, predicting, and ultimately changing the motivations underlying these behaviours that lead to fatalities and injuries. One theory that has proved useful in

understanding safe (e.g., bicycle helmet use; Lajunen and Räsänen, 2004) and risky (e.g., speeding and other traffic violations; Newnam et al., 2004; Parker et al., 1992) road user behaviours is the theory of planned behaviour (Ajzen, 1991).

1.1 Theory of Planned Behaviour

The theory of planned behaviour (TPB; Ajzen, 1991) maintains that people's intentions (i.e., readiness to act) are the most proximal determinant of their behaviour. Intentions are predicted by attitudes (positive or negative evaluations of performing a behaviour), subjective norm (perceived social pressure or approval to perform or not perform a behaviour), and perceived behavioural control (PBC; perceived ease or difficulty of performing a behaviour, also believed to be a direct predictor of behaviour). A meta-analysis of 185 tests of the TPB provided support for the efficacy of the model in explaining approximately 39% of the variance on average in intention and 27% of the variance (with a further 2% attributable to PBC) on average in behaviour, across a variety of contexts (Armitage and Conner, 2001). A further advantage of the TPB is the potential for expansion of the model to incorporate additional context-relevant factors that may impact on decision making with the proviso that these factors explain additional variance over and above the standard TPB constructs (Ajzen, 1991).

To date, the TPB has been applied as a theoretical framework in two studies in the motorcycle riding context (Elliott, 2010; Jamson et al., 2005). Jamson et al. (2005) explored 4929 motorcycle riders' intentions to engage in a range of risky riding behaviours including speeding, riding while intoxicated, and fast cornering (not braking when entering a bend). Across all behaviours, consistent predictors were past behaviour and attitude. For some of the behaviours (e.g., speeding, drink-riding), PBC emerged as a significant

predictor of intentions also. Elliot (2010), adopted an extended version of the TPB incorporating additional social influences (group norm, group identity) and self-identity to determine the predictors of 110 motorcyclists' intentions to speed on 30mph urban roads and 70mph motorways and found that attitude was the only consistent predictor of people's intentions across scenarios, with PBC emerging as a predictor for intentions to speed on 30mph urban roads only. For people's intentions to speed on 70mph motorways, self-identity as a fast rider, group norm (with the referent group of friends who are motorcyclists), group identity, and the interaction between group norm and group identity were additional predictors.

Together, this research suggests that an extended version of the TPB may be an effective framework to understand motorcycle riders' behaviour. The focus of these studies, however, has either been on a single type of behaviour (e.g., speeding; Elliott, 2010) when there are a range of potentially modifiable behaviours, or where a range of behaviours have been considered, the focus has been primarily on risky behaviours (Jamson et al., 2005). While understanding the motivational determinants of risky behaviour is important, of equal importance is gaining an understanding of the factors that encourage a rider to ride safely. Given that the central aim of reducing rider fatalities and injuries on the road involves not only reducing risky behaviours, but also increasing safe riding, we adopted an extended TPB approach to understand motorcycle rider's motivations to engage in both safe and risky riding behaviours. In extending the TPB we included both social influence and self-identity constructs (see also Elliot, 2010) as well as personal influences of sensation seeking and aggression.

1.2 Social and Self-Identity Influences

Many researchers have highlighted the relative weakness of subjective norm (representing the level of approval from a range of important others about what the individual should do) in predicting people's intentions and have argued for a reconceptualization of the normative component to adequately capture other social influences (Terry and Hogg, 1996; Terry et al., 1999). For instance, in the road safety context, some studies have attempted to strengthen the subjective norm component by nominating specific referent groups (e.g., other drivers), in a manner representative of normative beliefs, rather than simply asking about the people who are important to them generally as an aggregate measure of all normative influence (e.g., Gordon and Hunt, 1998; Haglund and Aberg, 2000; Parker et al., 1992). Other studies have expanded the normative component of the TPB by using group norm (akin to descriptive norm; representing a person's perception of what members of a specific referent group actually do) (Terry and Hogg, 1996). Motorcycle riding is often undertaken as a group activity (Krige, 1995) and it may be useful to include a consideration of the influence of other riders' actions on the individual rider's decision making. Therefore, the introduction of a specific relevant referent group (e.g., 'the people I ride with'), for both a specific subjective norm and a group norm measure in the current study, may provide a stronger assessment of the social influences contributing to motorcycle riders' intentions to perform risky and safe riding behaviours than the traditional TPB subjective norm construct alone (e.g., 'the people who are important to me').

In addition to expanding the normative component of the TPB, a measure of self-identity was included. The concept of self-identity relates to an individuals' perception of themselves as fulfilling a particular role or identity (e.g., a father, a husband) (Stryker,

1968). The more a person values a particular role or identity and the more committed they are to this role or identity, the more likely they will be to perform identity-consistent behaviours (Armitage and Conner, 2001; Terry et al., 1999). The impact of self-identity in the road safety context has been explored in several studies which have found that both 'safe' (e.g., 'safe pedestrians'; Evans and Norman, 1998) and 'risky' (e.g., 'fast rider'; Elliot, 2010) road user identities are predictors of intention in an extended TPB model. Given the evidence for safe and risky road user identities, the present study examines the impact of both safe and risky rider identities on intentions to engage in safe and risky riding behaviours, respectively.

1.3 Personal Influences: Sensation Seeking and Aggression

In addition to the social and self-identity influences, personal influences such as propensity for sensation seeking (Zuckerman, 1979, 1994; Zuckerman et al., 1964) and aggression may factor into motorcycle riders' decisions to engage in safe and, particularly, risky behaviour. High sensation seekers are proposed to either underestimate or accept risks as the price of the sensation or experience (Zuckerman, 1994). Zuckerman (1979) 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, and that sensation seeking in combination with other personal factors, such as hostile aggression, may be more predictive of crashes and other risky behaviour (Hartman and Rawson, 1992; Horvath and Zuckerman, 1993; Zuckerman, 1994). Although Zuckerman's (1979, 1994) Sensation Seeking Scale has been shown to be reliable, it may lack face validity within a road safety questionnaire, particularly when related to motorcycle safety issues (Watson et al., 2003). Therefore, in addition to a measure of on-road aggression, the thrill-seeking

dimension of the Driver Stress Inventory (Matthews et al., 1997) which has items relating to road user behaviour was used as an alternative in the current study to test the role of these personal influences in predicting motorcyclists' safe and risky riding intentions.

1.4 The Current Study

In addressing the critical need to increase motorcycle riders' safety on Australian roads, we used an expanded version of the TPB to identify the psychosocial predictors of riders' intentions to engage in three safe (handling my motorcycle skilfully, maintaining 100% awareness, refusing to ride impaired) and three risky (bending road rules to get through traffic, pushing my limits, and performing stunts and/or riding at extreme speeds) riding behaviours. This extended version included the original standard TPB predictors of intentions (attitudes, subjective norm, and PBC), as well as the additional social (group norm, specific subjective norm), identity (self-identity) and personal (sensation seeking, aggression) predictors of intentions proposed for the current study. For motorcycle riders' motivations to engage in the three safe riding behaviours, it was hypothesised that:

H1: Intentions to engage in the three safe riding behaviours would be predicted by riders' attitudes toward, perceived social pressure/approval for, and perceived ease or difficulty of, performing the three safe riding behaviours (i.e., the standard TPB predictors).

H2: The additional social (perceived pressure/approval from the people the individual rides with and what the people the individual rides with actually do) and identity (perception of oneself as a safe rider) factors would predict intentions to perform the three safe riding behaviours, over and above the standard TPB variables.

H3: The personal factors of sensation seeking and aggression would be inversely related to motorcycle riders' intentions to engage in the three safe riding behaviours (such that lower levels of sensation seeking and aggression would predict safe riding intentions), and would explain additional variance over and above the standard TPB and additional social and identity factors.

H4: The socio-demographic factors of age, gender, and average hours riding on road per week would predict intentions to perform the three safe riding behaviours over and above the standard TPB, additional social, identity, and personal variables.

In relation to motorcycle riders' decisions to engage in the three risky riding behaviours, it was hypothesised that:

H5: Motorcycle riders' intentions to engage in the three riskier riding behaviours would be predicted by their attitude toward, perceived social pressure/approval for, and perceived ease or difficulty of, engaging in the three risky riding behaviours (i.e., the standard TPB predictors).

H6: The additional social (perceived pressure/approval from the people the individual rides with and what the people the individual rides with actually do) and identity (perception of oneself as a risky rider) factors would predict intentions to perform the three risky riding behaviours, over and above the standard TPB variables.

H7: Sensation seeking and aggression would be positively related to riders' intentions to engage in the three risky riding behaviours, and would predict intentions over and above the standard TPB and additional social and identity variables.

H8: Age, gender, and average number of hours riding on road per week would predict riders' intentions to perform the three risky riding behaviours over and above the standard TPB, additional social, identity, and personal variables.

2 Method

2.1 Participants and Procedure Prior to conducting the study, ethical clearance was applied for and granted from the university's ethics committee. Participants for the study were recruited primarily from two sources: public 'Rider Survivor' events (a state government initiative developed in response to increased motorcycle fatalities and injuries to engage the riding community and raise awareness about motorcycle safety through a variety of forums including displays, demonstration, and discussion; Department of Transport and Main Roads, 2010a) (40%) and a mail out to a random sample of riders using the database of a private motorcycle rider training company (60%). At the time of data collection, this company was the largest provider of motorcycle rider training in Queensland, Australia serving a wide cross section of riders differing in age, gender, experience, and frequency of riding. As such it was assumed that these two recruitment strategies would provide a reasonably representative sample of on-road riders in Queensland. In keeping with privacy legislation and university ethical guidelines, the questionnaires were posted by the training company so that no personally identifying details (i.e., name, address) from the database were seen by the researchers. Some additional questionnaires were distributed to motorcyclists who expressed interest, having heard about the research from other participants. All questionnaires were returned to the researchers via a reply paid envelope. A total of 738 questionnaires were distributed and 233 completed questionnaires were returned, representing a response rate of 32%.

Responses from four participants were excluded due to missing data, leaving a total of 229 valid responses.

Participants were 152 males (66%) ranging in age from 19 to 76 years ($M_{age} = 45.6$ years; $SD = 11.2$ years) and 75 (33%) females ranging in age from 21 to 62 years of age ($M_{age} = 42.3$ years; $SD = 10.4$ years), and resided primarily in South East Queensland, Australia. Most respondents (94%) held an open motorcycle licence. In addition, almost all of the participants held a current, open, car licence (1% had a provisional car licence) and approximately a third of respondents held a current truck or bus licence. Most riders were experienced ($M_{riding\ experience} = 11.3$ years, $SD = 10.9$) although female riders ($M_{riding\ experience} = 5.9$ years) were significantly less experienced than males ($M_{riding\ experience} = 13.9$ years; $t(208) = 6.31, p < .001$). Approximately 60% of the sample reported they had undertaken Q-Ride training (a competency-based training program involving assessment to ensure that riders have the required level of riding skill and proficiency to obtain a licence; Department of Transport and Main Roads, 2010b). Fifty nine percent of the sample rode, on average, five or more hours per week ($M = 9.0$ hours, $SD = 11.7$ hours). Almost half the sample (46%) stated that they rode at least three times per week. Most respondents (87%) stated that they sometimes or often rode with other people. Approximately 11% of participants had suffered a permanent injury or disability resulting from a motorcycle crash.

The questionnaire was based on motorcycle questionnaires used previously in the literature (e.g., Elliott et al., 2003; Watson et al., 2003), theoretical specifications of the TPB (Ajzen, 1991), and a separate qualitative study using focus groups (Author/s names withheld, submitted). The questionnaire comprised extended TPB items assessing riding attitudes, subjective norm, specific subjective norm, group norm, PBC, self-identity, and

intentions for each of the three safe and risky riding behaviours (see Section 2.2). Sensation seeking and aggression, as well as the socio-demographic variables of age, gender, and average number of hours spent riding each week (i.e., riding exposure) which are commonly found to influence road user behaviour, were assessed also.

The questionnaire was piloted initially on 39 riders who had either participated in previous qualitative research (Author/s names withheld, submitted) or had attended a public ‘Rider Survivor’ event. Rider feedback on the questionnaire was provided either verbally or written on the questionnaire by those who chose to take the questionnaire home and return it via mail. The data obtained from this preliminary questionnaire was used to determine internal consistency and validity of the measures (the data collected was not included in the analyses reported in this paper). Substantive adjustments were made to the questionnaire on the basis of this feedback and data analysis. A second revised version of the study questionnaire was then piloted on six motorcycle riders and some minor adjustments were made on the basis of the feedback received. A further refined, third version of the questionnaire was used to measure the constructs described below in Section 2.2.

2.2 Measures

The measures used in the current study were theoretically driven, based on the specifications of the TPB (Ajzen, 1991, 2006), and informed by qualitative pilot work reported elsewhere which explored the relevance of these constructs to the motorcycle riding context and, importantly, identified the six behaviours used in the current study and revealed the need for a separate examination of the predictors of safe and risky riding intentions (Author/s name/s withheld, submitted). The target behaviours in the current

study were operationalised to reflect three 'safer' and three 'riskier' riding behaviours. The three behaviours representing safer riding were:

- (1) handle my motorcycle skilfully;
- (2) always be 100% aware of the traffic and surrounding road environment
(presented as "maintain 100% awareness" for brevity in the current paper); and
- (3) refuse to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in any way (presented as "refuse to ride impaired" for brevity in the current paper).

The three riskier riding behaviours described behaviour that may lead to fatal or serious injury crash involvement for the motorcyclist, their pillion passenger, or other road users.

These behaviours were:

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

All extended TPB items and sensation seeking and aggression items were measured on 7-point Likert scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) unless otherwise stated. Prior to answering the extended TPB items, participants were asked to "think 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".

2.2.1 Intention

Intention was measured using 1 item for each of the three safer and three riskier behaviours, with the format: It is likely that I will <do the behaviour> (e.g., It is likely that I will bend road rules to get through traffic).

2.2.2 *Standard TPB Predictors*

2.2.2.1 *Attitude*

A separate 1-item attitude measure was used for each of the three safer and three riskier riding behaviours, with the structure: <Doing the behaviour> is important to me (e.g., Handling my motorcycle skilfully is important to me).

2.2.2.2 *Subjective norm*

Subjective norm was assessed using 1 item for each of the six behaviours, using the format: Most people who are important to me would want me to <do the behaviour> (e.g., most people who are important to me would want me to push my limits).

2.2.2.3 *PBC*

One item for each of the three safer and riskier behaviours was used to measure PBC with the statement: Whether or not I <do the behaviour> is completely within my control (e.g., Whether or not I am always 100% aware of the traffic and surrounding road environment is completely within my control).

2.2.3 *Extended TPB Predictors*

2.2.3.1 *Specific subjective norm*

An additional subjective norm construct for each of the six behaviours, measuring the influence of a salient referent group (the people I ride with), was measured using the following format: The people I ride with would want me to <do the behaviour > (e.g., The people I ride with would want me to perform stunts and/or ride at extreme speeds).

2.2.3.2 *Group norm*

The perceived normative behaviour of the referent group was included for each of the six behaviours, and measured using the format: The people I ride with

would <do the behaviour> (e.g., 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).

2.2.3.3 *Self-identity*

To assess whether a person identified themselves as a safe or risky rider, participants were instructed to think about their riding on public roads in the last 12 months. Participants then indicated their agreement with the following statements on a 7-point Likert scale, 1 (*strongly disagree*) to 7 (*strongly agree*) for safe (“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”; $r = .57$) and risky (“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”; $r = .54$) riding.

2.2.3.4 *Sensation seeking*

Sensation seeking was measured using an adaptation of a driver thrill seeking scale used by Stradling et al. (2004) (e.g., “I enjoy the sensation of accelerating rapidly”; “I like to raise my adrenalin levels while riding”). 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. Participants were instructed to consider how they felt while riding and responded to the statements on a 7-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). The original scale was found to have high reliability according to Stradling et al. ($\alpha = .91$). Once adapted for motorcycle riders, the scale used in this study still possessed good reliability ($\alpha = .88$).

2.2.3.5 *Aggression*

A measure of propensity for on-road aggression was compiled by creating a 6-item scale based on previous pilot work (Author/s name/s withheld, submitted) and adapted

items from the Driver Behaviour Questionnaire (Reason et al., 1990) (for a full listing of items contact the authors). Participants were asked to think about their riding on public roads in the last 12 months and to indicate how often they experienced the behaviours listed on a scale from 1 (*never*) to 7 (*always*) (e.g., “how often have you felt angry and aggressive towards another road user”). The scale was reliable ($\alpha = .72$).

2.3 Data Analysis

Prior to hypothesis testing, data were screened (e.g., missing values, normality etc). A number of variables were skewed beyond the acceptable range of ± 3.3 ; however, given that all skewed variables were in the expected direction and made theoretical sense (e.g., highly positive attitudes were expected for safe behaviours and highly negative attitudes for performing risky behaviours), no transformation of the data were performed. In terms of missing data, the four cases identified with substantial missing data were removed from analyses. No missing values were imputed. For additional cases with missing data in regression analyses, the default setting in SPSS to delete cases list-wise was used. Correlational analysis was employed to explore the relationship between the safer and riskier intentions. Separate hierarchical regression analyses were used to determine the predictors of intentions to perform the three safer and three riskier riding behaviours. In line with H1 and H5 to assess the predictive utility of the standard TPB, attitude, subjective norm, PBC were entered in the first step of the regression analysis. The additional normative (specific subjective norm, group norm) and self-identity (as a safe or risky rider) factors were entered at the second step to determine the ability of these predictors to increase the explained variance in intentions over and above the standard TPB variables (H2 and H6). Sensation seeking and aggression comprised the third step of analyses to test

H3 and H7 that these personal variables would predict intentions over and above the standard TPB, and additional social and identity factors. Age, gender, and average number of hours spent riding each week were entered in the fourth step to determine whether these socio-demographic variables increased the explained variance in rider intentions over and above the standard TPB, and additional social, identity, and personal factors (H4 and H8). The regression beta weights presented are those obtained at the final step of the analysis.

3 Results

The correlation analysis ($n = 225$) presented in Table 1 generally confirmed the validity of grouping intentions into the two categories of 'safe' and 'risky'. Intentions to handle my motorcycle skilfully were positively correlated with intentions to maintain 100% awareness and negatively correlated with all of the intentions to perform the riskier behaviours, as expected. Similarly, intentions to perform the riskier behaviours were positively correlated with each other. However, the measure of intention to refuse to ride impaired did not correlate with any of the other intention measures.

Insert Table 1 about here

3.1 Prediction of Intentions to Engage in Safer and Riskier Riding Behaviours

The hierarchical regression analyses for the prediction of intentions to perform the three safer and three riskier riding behaviours are presented in Tables 2 and 3, respectively (beta weights are those presented at the final step of analyses). In all three safer rider models, the combination of the standard TPB variables significantly predicted intentions; however, PBC was the only significant predictor. Group norm and a greater average number of hours riding on road per week were additional predictors of intention to maintain 100% awareness (although the R^2 change value was not significant for hours riding on

road). Specific subjective norm was an additional significant predictor of intention to refuse to ride impaired.

For the riskier rider models, the combination of the standard TPB variables significantly predicted intentions with attitude consistently emerging as a significant predictor. Subjective norm and PBC also significantly predicted riders' intentions to push their limits. In two of the three riskier riding behaviour models (intentions to bend road rules and push my limits), the specific subjective norm variable was a significant additional predictor of intentions. In addition, self-identity as a risky rider predicted intention to push my limits, and self-identity as safe rider significantly predicted intentions to perform stunts and/or ride at extreme speeds. The addition of sensation seeking and aggression in the third step contributed additional variance with sensation seeking emerging as a significant predictor for all three intentions to perform riskier behaviours, and aggression significantly predicting riders' intentions to bend road rules to get through traffic, only. In terms of the socio-demographic variables, age significantly predicted intention to perform stunts and/or ride at extreme speeds, with younger riders more likely to intend to engage in this behaviour.

Insert Tables 2 and 3 about here

4 Discussion

The aim of the current study was to use an extended theory of planned behaviour (TPB) perspective incorporating the standard TPB predictors (attitude, subjective norm, PBC) and additional social (group norm, specific subjective norm), identity (self-identity) and personal (sensation seeking, aggression) influences to identify the psychological and

social factors predicting motorcycle rider intentions to engage in three safe (handle my motorcycle skilfully; maintain 100% awareness; and refuse to ride impaired) and three risky (bend road rules to get through traffic; push my limits; and perform stunts and/or ride at extreme speeds) riding behaviours. Across the analyses age, gender, and hours riding on road per week did not generally contribute to the prediction of safe and risky rider intentions. One exception was that age (being younger in age) significantly predicted intention to perform stunts and/or ride at extreme speeds, a finding that is consistent with much previous research suggesting that people younger in age are generally more likely to speed and take risks than people older in age (Fergusson et al., 2003; Fitzgerald et al., 1998; Stradling et al., 2004). Another exception was that the reported number of hours riding on the road per week (more hours) significantly predicted intention to maintain 100% awareness; although the block of variables in which it was added did not significantly add to the prediction of intention (see Table 2).

4.2 Efficacy of the extended TPB in predicting safe and risky rider intentions

Overall, there was qualified support for the utility of the extended TPB model in predicting safe and risky rider intentions. The amount of variance explained for intentions to perform the three 'riskier' behaviours (R^2 ranged from 58% - 66%) was much greater than for intentions to perform the three 'safer' behaviours (R^2 ranged from 22% - 39%). This trend may be a result of these 'safer' behaviours being governed by more habitual or automatic responding, rather than by a conscious choice to specifically ride safely. However, the absence of a measure of past behaviour or habit prevents definitive conclusions being drawn as to the reason underlying this discrepancy in the amount of variance explained by the TPB. Perceived behavioural control was the only consistent

predictor of all three 'safer' riding behaviours, suggesting that intentions to perform 'safer' riding behaviours may depend more on the amount of control a rider perceives they have over the behaviour. Risky riding intentions appeared to be predicted by a much wider range of factors, with attitude and sensation seeking emerging as the consistent predictors for intentions to perform the three risky behaviours. The finding of attitude as a consistent predictor is supported by the general TPB literature (Armitage and Conner, 2001) although some studies into risky road practices have found PBC or subjective norm to be better predictors of intentions than attitude (e.g., Evans and Norman, 1998; Parker et al., 1992).

The emergence of sensation seeking as a significant predictor of intentions to perform the three riskier behaviours is consistent with much of the literature within traffic psychology which links risky driving practices with sensation seeking (Jonah, 1997a, 1997b). However, the amount of individual variance accounted for by sensation seeking in this study was lower (between 2% - 6%) than that found by other studies (e.g., 10-15%, Jonah, 1997a). This discrepancy may reflect a bias due to the greater number of older participants in this study and the tendency for sensation seeking tends to decrease with age (Zuckerman, 1994). An alternative explanation may be that, in contrast to previous studies, the contribution of sensation seeking in predicting intentions in the current study was assessed within the context of an extended TPB framework, and that the standard and extended TPB predictors were entered into the model prior to sensation seeking. In contrast to the suggestion of previous researchers (e.g., Hartman and Rawson, 1992; Horvath and Zuckerman, 1993; Zuckerman, 1994) that sensation seeking, in combination with other personal factors such as hostile aggression, may be more predictive of risky

behaviour, aggression was only a significant predictor (along with sensation seeking) for intentions to bend the road rules to get through traffic.

4.3 Social and self-identity factors and safe and risky riding intentions

Many studies have found subjective norm to be a weak predictor of behavioural intentions (Armitage and Conner, 2001), and, in this instance, subjective norm ('people who are important to me') did not appear to predict riding intentions as often as specific subjective norm ('people I ride with') which was a significant predictor of risky (bend road rules, push limits) and safe (refuse to ride impaired) riding intentions. This finding provides support for the opinion that the traditional subjective norm construct may not capture social pressure adequately (Terry and Hogg, 1996). As argued by Parker et al. (1992), the importance of specific subjective norm (termed 'salient referents' in their study) may be enhanced in circumstances where there is the physical presence of other people. Fellow riders are likely an important source of influence on intentions (and ultimately behaviour) not only by virtue of their physical presence, but also because of the relationship that appears to be forged between riders (Author/s name/s withheld, submitted). Lending further support to the relative strength of specific subjective norm in this study, group norm (the behaviours of 'people I ride with') did not emerge as a significant predictor of intentions (with the exception of intention to maintain 100% awareness). Therefore, it appears that respondents were influenced more by explicit pressure they perceived from their fellow riders, rather than what these riders actually do. Future researchers may wish to explore further the influence of group norm using specific group-based riding situations where group members' visible actions may be more influential.

Self-identity did not emerge as a significant predictor of safe or risky riding intentions with the exception that self-identity as a risky rider predicted respondents' intentions to push their limits and self-identity as a safe rider was negatively related to respondents' intentions to perform stunts and/or ride at extreme speeds. The latter result is consistent with Elliot's (2010) finding that identity as a 'fast rider' predicted intentions to speed on a 70mph motorway. Together, these findings suggest that, for these deliberate, self-challenging, types of actions, self-identity may be a significant factor. Similarly, Evans and Norman (1998) found that self-identity significantly predicted two of three road crossing intentions, accounting for an extra 3% variance above the standard TPB variables. Thus, there is some utility in including an assessment of self-identity in future studies; however, given the findings of the present study, this construct may be best used in a targeted manner for actions that might reinforce more one's identity as risky rider (e.g., riding at extreme speeds and performing stunts).

4.4 Strengths and Limitations of the Research

The current study has several strengths including its strong theoretical foundation and the prediction of intentions to perform both safe and risky riding behaviours as well as a study design that allowed an examination of the contribution of the standard and extended TPB predictors. Overall, the study provided further support for the application of the TPB in the motorcycle riding context and showed that the proposed extensions to the model were better able to account for riders' decisions to engage in safe and risky riding than the standard TPB alone. Despite these strengths, there are a number of limitations which should be considered when interpreting results. The study mainly attracted recreational, older, riders from South East Queensland, with only 4% of the sample aged younger than 25

years. While the sample obtained is similar to samples described in other Australian studies (e.g., de Rome et al., 2002), the behavioural intentions of riders aged younger than 25 years who are most at risk of serious injury and death from motorcycle crashes were not well represented in the current 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; Watson and Steinhardt, 2006), 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. Future researchers may, therefore, wish to focus specifically on younger and unlicensed riders, as well as non-recreational riders, to identify the determinants of their safe and risky riding behaviours.

Given the anonymous nature of the survey, it was not possible to send reminder notices. The absence of a reminder system may have resulted in a lower response rate and potential sample bias due to differences between respondents and non-respondents. To reduce the survey length, the survey incorporated single-item measures of the extended TPB constructs and intention for each of the six target behaviours. Ideally, at least two items should be included to increase reliability. Further, although intentions are considered to be a valid proxy measure of behaviour (Ajzen, 1991), further research is required to confirm the intention-behaviour relationship in the context of safe and risky riding. Finally, although this study considered additional determinants of intention including self-identity, group norm, sensation seeking and aggression, there may be other variables that are relevant to the performance of safe and risky riding behaviours. For example, past behaviour or habit may be particularly relevant in the riding context, especially for safe

behaviours that may become more internalised and automatic for the rider over time (e.g., handling the motorcycle skilfully). Perceptions of risk related to safe and unsafe riding behaviours may also be worth investigating, as well as a rider's perception of a riding behaviour as intrinsically right or wrong (i.e., moral norm), and their affective and cognitive assessment of the consequences of performing risky and safe riding behaviours (e.g., anticipated regret).

5 Applied Implications and Future Research

Based on the findings of the current study, several applied suggestions can be made. Perceived behavioural control was the consistent predictor of safe riding intentions, suggesting that fostering a sense of control over safe handling and use of the motorcycle will increase riders' intentions to perform safer behaviours. The emergence of attitude and sensation seeking as consistent predictors of risky riding intentions suggests that it may be worth engaging riders in a cost-benefit analysis of risky riding behaviours and encourage them to consider whether the benefits of risky riding (especially those that might relate to the 'thrill' of riding dangerously) really do outweigh the costs (e.g., possible injury/death). This could be undertaken through mass media campaigns targeting riders or as an adjunct to conventional rider training programs. In addition to riders' attitudes, future research should also consider the attitudes and behaviours of other road users (particularly car drivers) given that a large proportion of motorcycle crashes result from errors made by other vehicles and often drivers claim not to have seen the motorcyclist (e.g., de Rome et al., 2002; Haworth et al., 1997).

The specific subjective norm construct reflecting the expectations of an important referent group appeared to be a more important social determinant of riders' intentions,

rather than subjective norm or group norm (perception of what other riders do), given that it emerged as a predictor for three of the behaviours examined. This social influence may have important implications for rider training and education as the role of the perceived expectations of the group may need to be factored into future initiatives. In particular, future research should examine whether interventions which target the group riding phenomenon as well as individual safe riding may prove more effective than those which focus purely on improving an individual's skills. It may also prove beneficial to increase understanding about the circumstances surrounding riding behaviour and crashes to determine how riding in groups can act as a protective factor and under what circumstances it may act as a risk factor, particularly among younger riders.

One's identity as a rider only had a limited contribution to decision-making with the results of the present study suggesting that more may be gained by focusing on group-based strategies to encourage safe, and discourage risky riding. Alternatively, there may be other factors that are worth examining in future research. For instance, future research could examine the role of perceived risk in predicting safe and risky riding intentions. Drawing from Evans and Norman's (1998) research, it may be worth considering perceived risk and the potential link between perceived risk and PBC, whereby behaviours that are considered to be easy to perform may be considered lower risk than behaviours considered as difficult to perform. Furthermore, it may be important to examine perceived risk in the context of the group to determine the extent to which a rider's perception of risk is influenced by the behaviour of other riders.

Overall, this study has highlighted the need for further research and development in the area of motorcycle safety. Most importantly, it has identified a range of psychosocial

predictors that appear to contribute to motorcycle rider intentions that are 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. For instance, Rowden, Watson, Wishart, and Schonfeld (2009) are currently in the process of evaluating such a rider training intervention, which has been designed to augment conventional skills-based programs. Public education programs targeting motorcycle riders also need to consider the personal and social factors contributing to safe and risky riding. For example, given the role of the specific subjective norm in predicting intentions in this study, there may be value in attempting to harness the camaraderie among motorcyclists to encourage safe riding and discourage risky riding.

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http://www.infrastructure.gov.au/roads/safety/publications/2007/pdf/road_rgr_200704.pdf.

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Table 1

Correlations Between Intentions to Perform Safe and Risky Riding Behaviours

Intention	1	2	3	4	5	6
1. Handling	-					
2. 100% aware	.62***	-				
3. Not if impaired	.05	.01	-			
4. Bending rules	-.17*	-.22**	.09	-		
5. Pushing limits	-.23*	-.28***	.02	.51***	-	
6. Stunts or speed	-.11	-.21**	-.02	-.44**	.72***	-

*** $p < .001$

Table 2

Regression Analysis Predicting Intentions to Perform Safer Riding Behaviours

Intention to handle the motorcycle skilfully (<i>n</i> = 183)						
Step		β	sr^2	R^2	ΔR^2	ΔF (<i>df</i>)
1	Attitude	.15	.01	.13	.13***	9.22 (3,179)
	Subjective norm	-.07	.00			
	PBC	.26**	.05			
2	Specific subjective norm	.13	.01	.18	.04	2.22 (4,175)
	Group norm	.03	.00			
	Self-identity – Safe rider	.03	.00			
	Self-identity – Risky rider	.10	.01			
3	Sensation seeking	-.11	.01	.19	.02	1.76 (2,173)
	Aggression	-.04	.00			
4	Age	.11	.01	.22	.03	1.86 (3,170)
	Gender	.04	.00			
	Hours riding on-road per week	.14	.02			
Intention to maintain 100% awareness (<i>n</i> = 182)						
Step		β	sr^2	R^2	ΔR^2	ΔF (<i>df</i>)
1	Attitude	.04	.00	.09	.09**	5.60 (3,178)
	Subjective norm	-.06	.00			
	PBC	.19*	.03			
2	Specific subjective norm	.12	.01	.21	.12**	6.64 (4,174)

	Group norm	.26**	.05			
	Self-identity – Safe rider	.04	.00			
	Self-identity – Risky rider	.03	.00			
3	Sensation seeking	-.05	.00	.21	.01	0.64 (2,172)
	Aggression	-.04	.00			
4	Age	.02	.00	.24	.02	1.66 (3,169)
	Gender	.08	.00			
	Hours riding on-road per week	.14*	.02			

Intention to refuse to ride impaired (*n* = 179)

Step		β	sr^2	R^2	ΔR^2	ΔF (<i>df</i>)
1	Attitude	.06	.00	.11	.11**	6.93 (3,175)
	Subjective norm	.01	.00			
	PBC	.15*	.02			
2	Specific subjective norm	.55**	.22	.37	.26**	17.88 (4,171)
	Group norm	.01	.00			
	Self-identity – Safe rider	-.12	.01			
	Self-identity – Risky rider	-.07	.00			
3	Sensation seeking	.13	.01	.38	.01	1.97 (2,169)
	Aggression	-.10	.01			
4	Age	-.06	.00	.39	.01	0.51 (3,166)
	Gender	.01	.00			
	Hours riding on-road per week	.05	.00			

Table 3

Regression Analysis Predicting Intentions to Perform Riskier Riding Behaviours

Intention to bend road rules to get through traffic ($n = 183$)						
Step		β	sr^2	R^2	ΔR^2	$\Delta F (df)$
1	Attitude	.29**	.04	.41	.41**	41.74 (3,179)
	Subjective norm	.10	.01			
	PBC	.04	.00			
2	Specific subjective norm	.18*	.02	.52	.11**	9.63 (4,175)
	Group norm	.11	.01			
	Self-identity – Safe rider	-.01	.00			
	Self-identity – Risky rider	.00	.00			
3	Sensation seeking	.21**	.02	.58	.06**	9.57 (2,173)
	Aggression	.18**	.02			
4	Age	-.04	.00			0.60 (3,170)
	Gender	.05	.00			
	Hours riding on-road per week	-.02	.00			
Intention to push limits ($n = 182$)						
		β	sr^2	R^2	ΔR^2	$\Delta F (df)$
1	Attitude	.21**	.02	.44	.44**	46.42 (3,178)
	Subjective norm	.13*	.01			
	PBC	.12*	.01			
2	Specific subjective norm	.19**	.02	.55	.11**	10.79 (4,174)

	Group norm	-.01	.00			
	Self-identity – Safe rider	.07	.00			
	Self-identity – Risky rider	.17**	.02			
3	Sensation seeking	.35**	.06	.62	.07**	14.56 (2,172)
	Aggression	.07	.00			
4	Age	-.09	.01	.63	.02	2.62 (3,169)
	Gender	.09	.01			
	Hours riding on-road per week	-.04	.00			

Intention to perform stunts and/or ride at extreme speeds (*n* = 183)

		β	sr^2	R^2	ΔR^2	ΔF (<i>df</i>)
1	Attitude	.56**	.14	.53	.53**	67.15 (3,179)
	Subjective norm	-.05	.00			
	PBC	.05	.00			
2	Specific subjective norm	.08	.00	.57	.04**	4.11 (4,175)
	Group norm	.02	.00			
	Self-identity – Safe rider	.11*	.01			
	Self-identity – Risky rider	.09	.00			
3	Sensation seeking	.32**	.05	.64	.07**	16.35 (2,173)
	Aggression	-.07	.00			
4	Age	-.13*	.01	.66	.02*	2.96 (3,170)
	Gender	.02	.00			
	Hours riding on-road per week	-.07	.00			
