MOTORCYCLE CRASH INVOLVEMENT AS A FUNCTION OF SELF ASSESSED RIDING STYLE AND RIDER ATTITUDES

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ABSTRACT

Approximately 1,500 riders (aged 25 and over) answered a questionnaire that asked about their riding patterns, behaviours, attitudes and crashes. Approximately 30% of the sample had been involved in a crash within the previous five years. As a subset of the data collected, the results reported here relate to 16 survey questions scored using Likert scales that respondents used to describe their riding style and assess their own skills compared to their peers, and their perceived likelihood of being involved in a crash in the future. Differences between those who had crashed previously and those who had not crashed were evident, indicating that the former are more over-confident and "worse" riders. Logistic regression revealed that five of the 16 variables usefully predicted crash involvement. The findings support the use of "insight"-type sessions as part of rider training and/or testing.

INTRODUCTION

The number of older motorcyclists killed or injured in crashes has increased in the last decade in many developed countries, including the United States (National Center for Statistics and Analysis Research and Development, 2005), Great Britain (Sexton, Broughton, Elliot & Maycock, 2004) and Australia (ATSB, 2006). In some countries, this increase has been the main contributor to an overall rise in rider fatalities. In Australia, the number of motorcyclist (rider and pillion) fatalities fell from a high of 299 in 1989 to 175 in 1997 and has since increased to 238 in 2006. There has been a decrease in the number of motorcyclists aged under 25 killed and an increase in the number of riders aged over 25 killed since 1991. The percentage of riders killed who were aged over 25 increased from 49% in 1991 to 70% in 2006 (ATSB, 2007).

This pattern is not confined to fatalities. In Victoria, as in other jurisdictions, the involvement of "older" motorcyclists in crashes has increased since 1990. The number of riders in crashes aged 30 and over more than doubled from 501 in 1991 to 1,120 in 2003. In contrast, the number of riders in crashes aged under 30 more than halved from 1,353 in 1991 to 663 in 2003. Riders aged 30 and over comprised 26.8% of riders in crashes in 1991 and this

increased to 63.2% in 2003. While the numbers of older riders in crashes have increased, older riders have lower crash rates per licence held (Haworth, Mulvihill & Symmons, 2002) and per distance travelled (ATSB, 2002). Thus, there appear to be two main rider groups of concern; riders aged under 25 who continue to be over-represented in casualty crash rates, and older riders aged 30-54 who are the fastest growing group among serious crashes.

The trends in motorcycle involvement in crashes have mirrored changes in motorcycle registration and rider licensing data. In Australia, the number of motorcycles registered increased by 18.7% from 1999 to 2004 (ABS, 2005), showing the strongest growth of any vehicle type in Australia. There is relatively less information available regarding the age profile of riders. In New South Wales, the number of motorcycles registered to people aged 40 and over increased by 57% between 1995 and 2000, while the number of motorcycles registered to people aged under 25 years decreased by 33% (de Rome & Stanford, 2002). At the same time, the number of licences held by older riders also increased.

In the area of car driver research, several studies (e.g., Svenson, 1981; McKenna, 1993; Horswill, Waylen & Tofield, 2002) have shown that drivers incorrectly rate themselves as more skilful, safer and slower, and less likely to have an accident than the average driver, a finding that has been observed to a greater extent in young novice drivers. However, little is known about the relationship between behaviours and attitudes and safety, particularly crash risk, among motorcycle riders. More importantly, little is known about how these 'psychological variables' mediate the relationship between age, sex and other demographic details and the rider's crash liability (Sexton et al., 2004). Even less is known about the relationship between attitudes and behaviours and crash risk among older riders.

Based on a large sample of motorcycle riders in the UK, Sexton et al (2004) found that self-reported errors were the most important behavioural contributors to accident involvement (after controlling for mileage). They argued that the link between these errors and accidents may be as much to do with a careless inattentive riding style and excessive speed as it is with lack of skill. Traffic errors (mostly associated with failures of hazard perception or observational skills) were the most consistent predictors. Control errors (mainly to do with difficulties of control associated with high speed, or errors in speed selection) were also important. Riding style and a liking for speed were identified as predictors of behavioural errors (that were themselves predictors of crashes). Such relationships lend support to the view that an important part of the motorcycle safety problem stems directly from the motivations that lead people to ride motorcycles in the first place, and presents a challenging problem for road safety.

This paper presents new analyses of data related to self assessed rider skills, attitudes and behaviours and crash outcome that were collected as part of a survey of older rider crash characteristics and countermeasures conducted in 2005. Preliminary analyses of a wide range of variables collected in this survey were presented in Mulvihill and Haworth (2005a). This paper aims to investigate the relationship between a set of rider attitudinal and behavioural factors and the likelihood of being involved in a crash.

METHOD

An on-line survey of Australian motorcycle riders was undertaken to explore potential contributors to crash risk, such as attitudes, personal characteristics, self-reported riding behaviours and level of experience and training (for more detail see Mulvihill & Haworth, 2005a and Mulvihill & Haworth, 2005b). To be eligible to participate, respondents must have ridden a motorcycle within the last five years and been at least 25 years old at the time of completing the survey. Riders were asked a subset of questions from a self-assessed riding skill scale (Sexton et al., 2004); the 'Motorcycle Rider Behaviour Questionnaire' (MRBQ), and a riding style scale (Guppy et al., 1989). The questions were designed to quantify the riders' behaviour and attitudes and to provide some understanding of the psychological antecedents of motorcycle crashes.

RESULTS

Sample description

Male riders represented 87% of the 1,500 valid questionnaire responses. The largest age group was 45-54 years old (32.9%), with 25.6% of respondents aged 35 to 44, 22.9% aged 25 to 34, and 16.4% aged 55 and over. Most of the respondents were residents of Victoria (45%), with 28% from New South Wales and 13% from Queensland. Overall, 93% of respondents held a full motorcycle licence, while 2% and 4% had learner permits and provisional or restricted licences respectively.

Respondents were classified as continuing, returned or new riders – riders who have held a motorcycle licence and ridden for many years (62% of respondents), riders who have held a licence for many years but only recently resumed riding regularly (17%), and riders who have only recently obtained a motorcycle licence (19%), respectively. Overall, 30% of respondents (445 riders) had had at least one on-road crash within the past five years; 65% of the continuing riders, 76% of the returned riders, and 70% of the new riders had crashed ($Chisq(2)=11.7$; $p<0.005$).

Riding style: items

The survey provided a significant amount of data on a range of attitudes, behaviours and other variables. Due to space restrictions, only a subset of that data is reported here.

A block of 12 opposing word pairs were provided, requiring respondents to choose along a seven-point scale (although the scale was not numbered) to describe their "way of riding". For example, respondents were to click along a scale to describe whether they thought they were more attentive or more inattentive riders. The pairs, shown below, list the presumed road safety beneficial pole first; it is assumed that an attentive rider would be less likely to crash than an inattentive rider. With the exception of the placid-irritable and considerate-selfish scales, which have been reversed here for consistency, the valence presented here matches that presented in the survey. The Likert scale pairs were:

attentive-inattentive	nervous-confident	slow-fast
careful-careless	patient-impatient	tolerant-intolerant
decisive-indecisive	responsible-irresponsible	placid-irritable
experienced-inexperienced	safe-risky	considerate-selfish

A separate set of six survey questions asked riders whether they believed that they were better riders than other riders of their age and gender at controlling the motorcycle, spotting hazards, getting out of hazardous situations safely, anticipating what other road users are going to do, and at avoiding hazardous situations. Each item ranged on a five-point Likert scale denoted as "much better" at one end through to "much worse" at the other end. The final question addressed in the current analyses asked riders how likely they thought they would be involved in an on-road crash within the next 12 months, compared to other riders of similar age and gender. Again, this item employed a five-point scale ranging from "much less likely to be involved in an accident" through to "much more likely to be involved in an accident".

Riding style: Crashed vs non-crashed riders

Of the 1,500 valid survey responses, 1,426 riders (95% of the total) completed all 12 opposing word sets, and 432 (32%) of those riders had crashed during the previous five years. Figure 1 displays the mean Likert scale rating for crashed and non-crashed riders for each scale (note that the minimum and maximum ratings are 1 and 7 respectively). Six of those comparisons resulted in significant differences at the 0.05 level (see Table A1 in the Appendix for further detail).

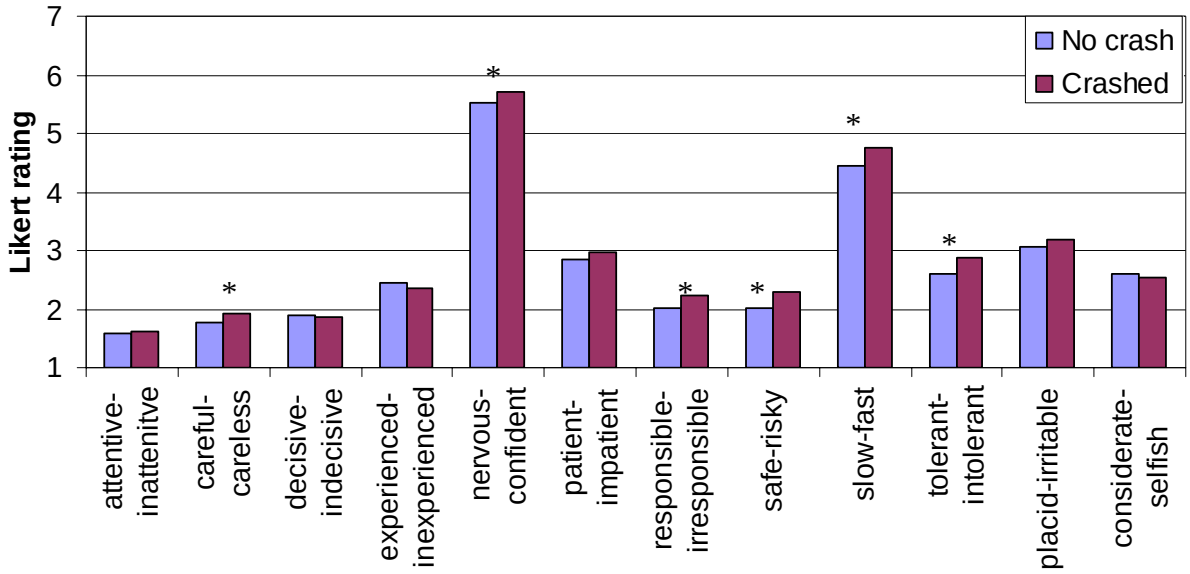

Fig 1. Comparative mean Likert scale ratings for the 12 attitudinal scales – crashed vs non-crashes. Significant differences ($p<0.05$) denoted by asterisk (see Table A1 in Appendix for further detail).

Riders who had crashed rated themselves as significantly more careless, confident, irresponsible, risky, fast and intolerant than riders who had not crashed in the previous five years. At first glance the confidence finding may seem somewhat contradictory – that an increase in confidence should logically make for a safer rider. However, in this instance it is reasoned that a more confident rider is probably liable to take risks, a view commonly reported in the literature.

A total of 1,368 respondents (91% of the total) indicated whether they had crashed within the previous five years and answered the item asking how likely they thought it was that they would be involved in an on-road crash in the ensuing 12 months. Of those riders who had not crashed, 64% thought they were less or much less likely to crash in the future, compared with 71% of the previously-crashed group, 35% versus 27% thought they were as likely to crash (non-crashed and crashed respectively), and 1.7% versus 1.8% of the non-crashed and crashed groups respectively thought they were more or much more likely than their same-gendered peers to crash within the next 12 months ($Chisq(2)=7.1$; $p<0.05$). The average Likert ratings indicated that on the whole both the crashed and the non-crashed riders thought they were less likely than their peers to be involved in a future crash, again suggesting an over-confidence in riding ability. Interestingly, the previous-crash group rated themselves as more likely to be safe than the non-crashed riders, although the difference

was minimal (M=2 versus M=2.1 respectively, where a score of three represents a rating of equally likely; $F(1,1366)=8.4$; $p<0.05$).

The survey called on respondents to rate themselves from much better to much worse than their peers for five safe riding behaviours – controlling the motorcycle, spotting hazards, getting out of hazardous situations, anticipating other road users, and avoiding hazards. While previously crashed riders and non-crashed riders both considered themselves better than their peers, the former were significantly more likely to rate themselves as better or much better than the non-crashed group for motorcycle control skills ($chisq(2)=17.7$, $p<0.0005$) and getting out of hazardous situations ($chisq(2)=7.3$, $p<0.05$). There was no significant difference for the other three variables. This pattern was also reflected in the Likert scale scores; the previously crashed group rated themselves as significantly better at handling a motorcycle than the non-crashed group (M=2.4 vs M=2.6 respectively, $F(1,1364)=18.9$, $p<0.0005$) and significantly better at getting out of hazards (M=2.5 vs M=2.5 respectively, $F(1,1361)=9.6$, $p<0.005$), with no difference between the groups for the other three variables.

Crash prediction

The 12 rider style scale variables, along with the six questions related to peer comparison for motorcycle skills and perceived likelihood of being involved in a crash in the future were all inserted into a binary logistic regression with the dichotomous variable 'crashed versus non-crashed' the dependent variable (using the "enter" method). A total of 1,310 respondents (87% of all respondents) had provided complete data across the 18 continuous covariate factors. Each predictor variable was coded such that lower scores denote presumed "safer" rider behaviour.

The inclusion of the predictor variables enabled the correct classification of 68.9% of cases (an increase from 67.9% of cases correctly predicted before inclusion). The Goodness of fit Omnibus test indicated that the inclusion of variables significantly improved the model ($Chisq(18)=75.3$, $p<0.0005$). Table 1 displays the five variables that make a significant contribution to the model.

Table 1. Variables that make a significant contribution to the binomial logistic regression model of crash prediction.

Variable	B	S.E.	Wald	Sig.	OR	95.0% C.I.	
						Lower	Upper
Motorcycle control	-0.35	0.12	8.70	0.00	0.71	0.56	0.89
Likelihood of a future crash	-0.25	0.09	7.70	0.01	0.78	0.66	0.93
Tolerant-intolerant	0.17	0.06	7.56	0.01	1.19	1.05	1.34
Avoiding hazards	0.26	0.13	4.05	0.04	1.29	1.01	1.67
Safe-risky	0.16	0.08	3.89	0.05	1.18	1.00	1.38

The best predictors of crash involvement were perceived above average motorcycle control skills, a perceived increased likelihood of being involved in a crash in the future, a more tolerant riding style, a greater perceived ability to avoid hazardous situations, and a “safer” (rather than risky) riding style (although this factor was significant *at* the 0.05 level rather than less than it, and the 95% CI range incorporates 1).

GENERAL DISCUSSION

Consistent with the general view in the literature, taken as a whole, the results indicate that motorcycle riders see themselves as better riders in a range of areas than other riders of a similar age and gender. As an extension of this finding, it is not surprising that survey respondents thought they were also more confident than other riders, regardless of their crash history, although it should be noted that respondents were *current* riders. Those who had experienced a serious crash or significant near miss leading to a crisis in confidence are probably less likely to have continued to ride after the incident and are therefore unlikely to have responded to the survey (although they were not precluded from responding since the questionnaire was online and open to anyone with a current motorcycle licence who had ridden in the previous five years).

There were also differences between crashed and non-crashed riders on a range of factors that, taken together, paint a general picture of greater self-confidence in the former. Motorcycle riders who had had a crash within the previous five years seemed to have a “worse” riding style than riders who had not crashed. They self-reported increased levels of carelessness and intolerance, a lack of responsibility, and a fast and risky riding style. All of these findings can be seen as indicative of an increased, and probably misplaced, level of confidence in riding ability.

Compared with those who had not crashed in the previous five years, crashed riders also thought they were less likely to crash in the future, perhaps because of their increased level of confidence. An alternative explanation, taken in isolation of the other findings, may be that these riders learned from their previous crash(es) and may not make the same mistake(s) again, reducing the likelihood of another crash. However, it would be expected that such an interpretation should be supported by a "*better*" rather than "worse" riding style as described previously. It is true that crashed riders rated themselves as better at handling a motorcycle and getting out of hazardous situations than their non-crashed counterparts, which in turn should serve to reduce the risk of a future crash.

It is not clear whether the differences in rider behaviour preceded or followed the previous crashes motorcyclists had experienced, and it would be difficult to track changes in behaviour without an in-depth interview of recently crashed riders or a longitudinal study. Nevertheless, the findings support the introduction of insight sessions as part of rider training and/or licensing processes. It is also possible that older riders may be more amenable to insight processes. Insight training aims to deflate unjustified feelings of self-confidence and seeks to make drivers or riders more accurate in their understanding of their own abilities and skills. It would seem logical that a crash should function as an insight experience, but the results reported here do not support that assumption – if anything crashed riders are *worse* riders than those who have not crashed, although it is not possible to know from the data how these riders may have scored *before* their crash, and therefore whether they may have actually improved because of the earlier crash. The length of time since the crash may also be an important mediating factor due to complacency. There may also be value in a countermeasure that targets riders who *have* crashed with insight training in a bid to emphasise and consolidate the self-learning that should arise from a crash. Motorcycle clubs may be well positioned to institute such a process as part of the likely social support meted out to members who have recently crashed and a funded trial is justified.

Finally, it should be noted that these findings are based on self-report data. It would be useful to objectively compare motorcyclists with a crash history with another group who had not crashed to determine whether they are actually "worse" riders. This could be done as an on-road or simulator-based study and would complement the results derived from this survey.

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APPENDIX

Table A1. Descriptive and ANOVA statistics for riding style analysis,

Attitudinal scale	No crash		Crashed		F-value	Sig level
	Mean	Sd	Mean	Sd		
attentive-inattentive	1.58	.68	1.61	.65	0.7	p>0.05
careful-careless	1.78	.76	1.93	.84	11.6	p<0.05
decisive-indecisive	1.88	.88	1.87	.85	0.1	p>0.05
experienced-inexperienced	2.45	1.50	2.36	1.34	1.0	p>0.05
nervous-confident	5.51	1.38	5.72	1.26	6.8	p<0.05
patient-impatient	2.83	1.46	2.96	1.48	2.2	p>0.05
responsible-irresponsible	2.01	1.02	2.23	1.17	12.5	p<0.05
safe-risky	2.01	1.00	2.28	1.18	19.4	p<0.05
slow-fast	4.46	1.14	4.76	1.19	20.2	p<0.05
tolerant-intolerant	2.60	1.29	2.88	1.42	12.4	p<0.05
placid-irritable	3.06	1.40	3.19	1.44	2.3	p>0.05
considerate-selfish	2.50	1.23	2.53	1.31	0.1	p>0.05