

# **Risk Taking by Motorcyclists: Rider Training and Stages of Change**

Peter Rowden, Barry Watson, and Narelle Haworth  
Centre for Accident Research and Road Safety – Queensland (CARRS-Q)  
130 Victoria Park Rd, Kelvin Grove, Queensland  
Email p.rowden@qut.edu.au

## **ABSTRACT**

Motorcyclists in Australia have been found to be 30 times more likely to be killed per kilometre travelled than car occupants and 40 times more likely to be seriously injured. One approach to preventing motorcycle-related injury is through training and education. While there is traditionally a major focus on developing riding skills during training for motorcyclists, there is also a need for training to promote safe riding to reduce subsequent risk taking. The Transtheoretical Model, commonly known as the 'Stages of Change' model, provides a rationale to support incremental behaviour change for risky riding that may be facilitated through motorcycle rider training and education. A sample of 438 learner motorcyclists attended a rider training program in Queensland, Australia, with the stages of change to adopt a safe riding mindset and safe riding practices being measured upon commencement of the course (Time 1) and then again upon completion (Time 2). A small subset of the original sample ( $n=45$ ) responded at follow up 24 months post training (Time 3). Consistent with the aims of training, results showed a significant shift from the contemplation stage to the subsequent stages of change for participants between Time 1 and Time 2. Progression to the later stages in the model was found for the subset of participants that responded at the Time 3 follow up. Issues of questionnaire design and the utility of the Transtheoretical Model for motorcycle rider training are discussed.

**Keywords:** motorcycle, rider training, road safety, transtheoretical model

## **1. Introduction**

Motorcyclists in Australia have been found to be 30 times more likely to be killed per kilometre travelled than car occupants and 40 times more likely to be seriously injured (Johnston, Brooks & Savage, 2008). One approach that aims to prevent motorcycle-related injury is rider training and education.

There is a strong focus in motorcycle rider training on developing vehicle-handling and manoeuvring skills, with the notion that these skills are required for safe riding. Results from crash studies partially support this notion, showing that vehicle-handling errors contribute to many novice rider crashes (ACEM, 2004; Hurt, Oullet & Thom, 1981; Elliott, Baughan, & Sexton, 2007). However, previous research has highlighted that risk-taking is also a key contributing factor in many motorcycling crashes and injury (Haworth, Smith, Brumen, & Pronk, 1997; Johnston et al., 2008; Jonah, Dawson & Bragg, 1982; Stella, Cooke, &

Spivulis, 2002). An international workshop for motorcycle safety drew the following conclusions, highlighting the need for rider training to address risk-awareness issues (OECD, 2008, p4):

“Countries have different training needs, based on their vehicle fleet and riding environment. Motorcycle training should therefore build on existing standards, focus on risk awareness and risk avoidance, and develop an understanding of the rider/motorcycle capacities and limitations.”

The Transtheoretical Model of Behaviour Change (Prochaska & DiClemente, 1983) offers a potentially useful theoretical approach to measure incremental change regarding risk taking by motorcyclists and for rider training interventions to address risk-taking. A brief overview of the model is provided below.

### **1.1 The Transtheoretical Model of Behaviour Change**

The Transtheoretical Model of behaviour change (Prochaska & DiClemente, 1983), otherwise known as the “Stages of Change” model, asserts that behaviour change is incremental in nature. Many behavioural programs are commonly only seen as successful if change in the target behaviour is complete, with no incremental measure of change. This has particular relevance to rider training evaluations in that crashes and offences have traditionally been the predominant outcome measures, with limited focus on intermediate or incremental measures of training effect. The balance of research into the effectiveness of formal motorcycle rider training programs over the past 30 years shows little or no reduction in crashes or traffic offences in comparison to riders who have received informal training (e.g. through friends) (Daniello, Gabler, & Mehta, 2009; Haworth & Mulvihill, 2005; Kardamanidis, Martiniuk, Ivers, Stevenson & Thistlewaite, 2010; Nairn, 1992). It could be implied from this lack of effect that training does not move riders to adopt and maintain low risk riding styles, however explicit measurement of such is lacking. It is argued here that to better understand how to improve the effectiveness of rider training a more detailed examination of risk taking issues and the mechanisms for incremental change is required.

The stages of change in the model are: pre-contemplation (no intention to change); contemplation (considering change); preparation (ready to change now); action (actively commenced change); maintenance (maintained desired behaviour for at least six months); and termination (cessation of dysfunctional behaviours) (Prochaska et al., 1998). Importantly, the model asserts that individuals do not have to progress through all the stages for an effective change in behaviour to take place. Very few people actually progress through to the termination stage where they feel no further temptation to engage in the dysfunctional behaviour. Furthermore, this stage is not applicable to adopting desired behaviours.

The 10 processes included in the model are: consciousness raising; dramatic relief; self-reevaluation; environmental reevaluation; self-liberation; social liberation; counterconditioning; stimulus control; contingency management; and helping relationships (Prochaska et al., 1998). Certain processes have been shown to be most useful at different stages to assist individuals to move to the next stage. For example, consciousness raising is a key process during the pre-contemplation and contemplation stages (Prochaska & DiClemente, 1983). In addition to the stages and processes there are three other core

constructs that underpin behaviour change in the model: decisional balance (the pros and cons of changing); self-efficacy; and temptation (Prochaska et al., 1998).

The model has been applied extensively in the context of cessation of dysfunctional behaviours such as cigarette smoking (Chang, 2006; Nigg et al., 1999; Prochaska & DiClemente, 1983), drink driving recidivism (Freeman et al., 2005), substance abuse (Chang, 2006; Migneault, Adams, & Read, 2005), and stress (Evers et al., 2006; Nigg et al., 1999). It has also been applied in the context of acquisition of desired behaviours such as sunscreen use (Nigg et al., 1999), cancer screening (Spencer, Pagell, & Adams, 2005), the wearing of seatbelts (Nigg et al., 1999), healthy diet (Chang, 2006; Nigg et al., 1999), and physical exercise (Chang, 2006; Nigg et al., 1999; Rhodes & Plotnikoff, 2006). Importantly, the model has also been successfully applied in a preventative context regarding the adoption of safe practices for participants yet to engage in potentially harmful behaviour (Kidd, Reed, Weaver, Westneat, & Rayens, 2003). As such, the Transtheoretical Model may offer a unique and valuable framework for measuring the adoption of low risk riding styles that can be prescribed in rider training to prevent subsequent risky riding.

For motorcycling, Broughton, Burgess, Fylan, and Stradling (2009) used the Transtheoretical Model as a framework for intervention design and evaluation of the RIDE program in Great Britain. The RIDE program addressed risky riding styles for motorcyclists that had been apprehended for traffic violations and were referred by police to attend training rather than lose their licence. The evaluation found that riders that attended the RIDE program reported moving through the stages of change to adopt safe riding styles more so than the control group.

## **1.2 Aims**

The aim of this paper is to document the extent to which a sample of motorcycle rider training participants moved through the stages of change between the start and finish of an existing rider training and licensing program in Queensland, Australia. The training that participants received did not systematically address risk taking issues. Hence, no specific hypotheses were formed for this study as no *a priori* expectations were held. However, a later intervention was to be designed using the sample from this study as a control group; hence the importance of examining the issue prior to the experimental treatment being applied. The paper also aims to discuss how the Transtheoretical Model can serve as a useful framework for future intervention development.

## **2. METHOD**

### **2.1 Participants**

A sample of 438 participants completing competency-based training to obtain a motorcycle licence was obtained through an industry partner organisation that was a registered service provider of Q-Ride<sup>1</sup> in Brisbane, Australia. Two hundred and seventy three participants

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<sup>1</sup> Q-Ride is a voluntary training scheme administered by Queensland Transport and Main Roads to obtain a motorcycle licence in Queensland. The scheme outsources training and assessment to private training organisations across the state. There is no minimum learner period in Q-Ride and no prior riding is required before attending the licence course. At the time of the study new licence applicants could obtain an R class licence (unrestricted capacity) if they had held a car driver licence for three years out of the past five.

(62.3% of the sample) responded to the Stages of Change questionnaire item at both of the times sampled during the course: the start of training (T1), and the finish of training (T2). Q-Ride is a competency-based licensing system with no set course duration and only those who eventually passed the assessment were sampled at the end of training. That is, by the nature of the system those who did not meet the competencies were non-completers and, hence, were not captured in T2 data (so the paper only examines those that progressed to licensing). The median age of respondents was 32 years ( $M = 33$ ,  $SD = 10.3$ ) and ranged from 16 to 65 years. Eighty seven percent of respondents were male. For licence class, 80% indicated that they were attending training to obtain an 'R' class licence (unrestricted capacity) while 20% were obtaining an 'RE' class (restricted). However, it is unknown how many of the R class applicants already held an RE class licence. Sixty one percent of respondents indicated that they had some previous on-road riding experience (median = 1yr). It is unknown how many had been riding unlicensed prior to the course due to the unknown percentage of riders graduating from RE to R class. There is also a lack of published data regarding the prior riding patterns of motorcyclists attending Q-Ride licence training to compare this sample to in . Participation was not anonymous as follow up matching of questionnaires for each participant was required; however all data was confidential.

A subset of 45 participants responded to an online follow-up questionnaire 24 months after training (T3). Forty three of these completed the Stages of Change item. These respondents slightly differed in age and gender from those who responded at both T1 and T2; 36 (80%) were male and 9 (20%) female. The median age was 31 years ( $M = 32$  yrs) with a range from 16 to 57 years.

## **2.2 Materials & design**

The design of the study was longitudinal, with repeated measures over the three time periods previously mentioned. The examination of stages of change was part of a larger study using a lengthy self-report questionnaire administered at T1 and T2 to measure a range of issues relating to risky riding. The questionnaire item for the stages of change was specifically created for this study. A single item to measure the adoption of safe riding practices at each stage in the model (see Appendix A) was created due to the length of the overall questionnaire and concerns regarding completion time. This did not include the termination stage as this is not relevant to the adoption of desired behaviours. Previous research (e.g. Broughton et al., 2009; Nigg et al., 1999; Cook & Perri, 2004) has used single items at each level for the stages of change component of the Transtheoretical Model to measure various behaviours. An information sheet and consent form was also developed to outline details of the study to participants and obtain their formal consent for participation. Envelopes were provided to seal completed questionnaires in to ensure confidentiality (to be opened only by the researchers). Additionally, an introduction to training video was produced to highlight the independent nature of the research from the licensing process in an effort to reduce demand characteristics.

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However, those holding a car driver licence less than three years had to obtain an RE licence (restricted) and hold it for at least one year before being eligible to upgrade to an R class licence with further training and assessment.

At T3 an online questionnaire measuring a range of risky riding issues was used to follow up participants from the original sample. An email or SMS text message was sent to all participants from the original sample to advise of the webpage address and request their participation. Reminder texts and emails were sent to all prospective participants one month after the original contact. Data was then linked to data at T1 and T2 through individual licence numbers provided at the time of responding.

## 2.3 Procedure

The study was conducted in the context of competency-based training and assessment conducted for the purpose of licensing. Riding instructors from the industry partner organisation administered paper-based questionnaires to participants at the start and finish of training. Participants were instructed to seal their completed questionnaires in envelopes to be opened only by the research team. A ‘train the trainer’ session was delivered by the researchers to ensure instructors were fully informed of the required procedures for data collection to minimise the potential for data contamination. This also included procedures to minimise potential demand characteristics and reinforce the independence of the research from the licensing process. The Chief Instructor, who had been integrally involved in all stages of project development, monitored data collection procedures. The web-based measure at T3 was hosted on the Queensland University of Technology server to avoid privacy issues relating to the confidential nature of information that might arise if hosted on external servers.

## 3. RESULTS

Table 1 shows the proportion of respondents that were classified in each of the five stages of change examined in the study at T1 and T2. Nearly half of the respondents indicated they were in either the action stage or maintenance stage at T1 and T2. This indicates that many of those with previous on-road riding experience thought they were already riding as safely as possible. Additionally, just over half of the respondents were classified in either the contemplation stage or preparation stage at T1 and T2. A shift in the proportion of riders from the contemplation stage into the subsequent stages of change, most notably the preparation stage, is evident when comparing the percentage of respondents in each category at T1 with T2. No respondents were in the pre-contemplation stage.

**Table 1.** *Percentage of respondents in each stage of change at each time*

|                        | <i>n</i> | Pre-cont | Contemplation | Preparation | Action | Maintenance |
|------------------------|----------|----------|---------------|-------------|--------|-------------|
| Start of training (T1) | 273      | 0        | 21.3          | 28.9        | 34.4   | 15.4        |
| End of training (T2)   | 273      | 0        | 16.2          | 38.1        | 36.0   | 9.7         |

McNemar’s nonparametric test for related samples found that there was a significant decrease in the likelihood of respondents being in the contemplation stage from T1 to T2,  $p < .05$  (therefore showing that a significant number of respondents moved from the contemplation stage into one of the later stages as none moved backward to the pre-contemplation stage). McNemar’s test also showed a significant increase in the likelihood of

being in the preparation stage from T1 to T2,  $p < .01$ . However, a significant decrease in the likelihood of being in the maintenance stage between T1 and T2 was found,  $p < .01$ , indicating that as a result of training some riders perhaps reappraised how safe their previous riding had been or had indeed relapsed from a safe riding style (the latter is doubtful as little actual riding is likely to have occurred between T1 and T2).

Table 2 shows responses across all three time periods for the small subsample of participants who responded to the follow-up survey 24 months post licence. They differed considerably in their T1 and T2 responses to the broader sample and, as such, are not representative of most riders in the initial sample. Additionally, some of the subgroup did not respond at T2. However, findings from this subgroup do highlight some interesting points in their own right regarding movement through the stages of change, particularly in regard to their reported adoption and maintenance of safe riding practices after licensing. The vast majority of the subgroup nominated that they were in the action or maintenance stage at T3. However, few reported to be in the preparation stage. This indicates that many had progressed from the preparation stage upon finishing training to adopt safe riding practices two years after training (as defined by self-report).

**Table 2.** *Percentage of T3 respondents in each stage of change at each time*

|                        | <i>n</i> | Pre-cont | Contemplation | Preparation | Action | Maintenance |
|------------------------|----------|----------|---------------|-------------|--------|-------------|
| Start of training (T1) | 43       | 0        | 16.3          | 34.8        | 44.2   | 4.7         |
| End of training (T2)   | 29       | 0        | 10.3          | 48.3        | 34.5   | 6.9         |
| 2yr follow-up (T3)     | 43       | 0        | 16.3          | 2.3         | 39.5   | 41.9        |

For the T3 subsample, McNemar's nonparametric test found that there was a significant decrease in the likelihood of respondents being in the preparation stage from T2 to T3,  $p < .001$ , and a significant increase in the likelihood of respondents being in the maintenance stage from T2 to T3,  $p < .05$ . Change in all other stages between T2 and T3 were non-significant for this subsample.

## 4. DISCUSSION

The examination of how learner riders progressed through the stages of change for adopting a safe riding mindset and safe riding practices during and after licence training was only a small part of the overall research project undertaken into rider training and licensing. However, the findings do offer some interesting evidence that rider training can have some influence on motorcyclists' decisions about risk taking and their safety. In light of much previous research that has found the relationship between rider training and crash reduction to be tenuous at best (Daniello et al., 2009; Kardamanidis et al., 2010; Nairn, 1991), this finding offers some indication that incremental change in the way riders consider risk is possible from rider training. The movement of participants from the contemplation stage to the subsequent stages of change between T1 and T2 conceptually aligns with one of the aims of rider training. That is, to ensure that those who have acknowledged their need to adopt safe riding practices at the start of training actually feel ready and equipped to do so by the end of training. For those who had already adopted safe riding practices prior to the

commencement of training (i.e. in the action or maintenance stage), the objective should be for training to reinforce such behaviour so that it is continued and the likelihood of lapsing into risky riding behaviours is reduced.

However, past research found that minimal attention to issues of risk taking was afforded compared to the time spent developing practical riding skills in a majority of rider training programs examined in the state of Victoria (Haworth, Smith & Kowadlo, 2000). This present study did not examine the amount of time dedicated to specific issues during training, but prior observations as part of the research project confirmed that there was no structured format for addressing risk taking issues during the course. That is, risk taking issues were discussed only if they arose in conversation during the course. Therefore, the finding that training had an effect to move participants through the stages of change to adopt a safe riding mindset and subsequent safe riding practices is somewhat surprising given the non-systematic nature in which risk-taking was addressed in the program. It is possible that this effect is merely an artefact of the licensing situation; that is, that participants expected that a licensing course should prepare them for safe riding and they responded accordingly. However, it is also possible that licence training does genuinely prepare students for safe riding and moves them through the stages of change to adopt safe riding practices. As data for the T3 subsample showed that a high proportion of riders felt they had progressed to either the action stage or maintenance stage two years after licensing, it is possible that safety values gathered from training transposed to actual riding styles post licence. However, it is also possible that participants' perceptions of what constitutes safe riding once licensed are not accurate (i.e. they think they are riding safely when maybe they're not). Further research is required to ascertain to what degree the acceptance of the safe riding mindset found in this study will actually transpose to crash involvement. Follow-up of participants' crash and offence data through Queensland Transport and Main Roads has been approved as part of this project.

Armitage (2009) reviewed the utility of the Transtheoretical Model and noted the growing body of evidence to support a two-stage conceptualisation where the pre-contemplation, contemplation, and preparation stage form a 'motivational' (i.e. intentions) component of the model and the action and maintenance stages form a 'volitional' component. In the context of licence training this conceptualisation makes sense, as active riding does not commence until after training for many licence applicants. Essentially, training can motivate the adoption of safe riding practices for new riders and provide self-management strategies, but it is once students finish training that they need to volitionally put such things into practice.

The findings of this study are not directly comparable to the study by Broughton et al. (2009) for the RIDE program in the United Kingdom as they used between groups comparisons (program vs controls) not within groups comparisons for the stages of change. They also treated the stages of change variable as continuous for the purpose of data analysis. This present study treated the stages as distinct categories (as this is how the model presents them), and therefore used an approach to data analysis suitable for categorical, repeated measures variables. Despite the differences in the approach to data analysis, each study found that the Transtheoretical Model provided useful insight into the effects of motorcycle rider training. Hence, the Transtheoretical Model appears to provide a worthwhile framework for assessing incremental program effects.

However, another aspect of the theory which was not specifically measured in either this study or the RIDE evaluation was how the 10 processes of change were utilised or the inter-relationships between all variables in the Transtheoretical Model. Armitage (2009) also noted that the processes of change have been generally neglected in research in comparison to examination of the stages of change and that further attention to the processes is warranted for interventions. The process of *consciousness raising* logically aligns with the aims of rider training to ensure that each person becomes aware of risk issues and their personal propensity for these. As such, this would be a suitable issue to address in targeted interventions for risk taking by motorcyclists. However, it is important to acknowledge that educational interventions are not limited to focusing solely on consciousness raising. For example, where the goal of an intervention is to provide participants with self-monitoring skills to enable continued behaviour modification over time then the process of *stimulus control* may be ideal to identify antecedents to risky riding and manage them. That is, for the rider to remove the antecedent stimuli from their environment or avoid situations where the stimuli is present. Furthermore, the process of *self-reevaluation* (reflection on self-image) may assist students to critically examine their beliefs about risk and accept new information. Hence, the processes included in the Transtheoretical Model are potentially a useful tool for new innovative training and education programs for motorcyclists.

#### **4.1 Strengths and limitations**

A particular strength of the research at T1 and T2 is that it was conducted in a real world motorcycle licensing and training context (Q-Ride) with the assistance of an industry partner training organisation. For potential limitations of the research, the study used self-report data, although measures such as the information sheet, introduction video, and riding instructor statements were employed to reduce potential demand characteristics and encourage honest responding. The use of only one item for each stage of change, while established as a suitable approach in some previous studies, also potentially affects the reliability of measurement. More research using additional items representing each stage is required to determine the validity of the single item measure used in this study. A further issue was that a low response rate at follow-up 24 months after training was encountered (i.e. at T3). Accordingly, it is unknown what motivated this small subsample of participants to respond at follow-up while others did not. Results at T3 should therefore be interpreted with caution as they are only applicable to a subsample of the original participant pool. Finally, the inability to determine how the results for stages of change are associated with subsequent crash involvement after licensing limits discussion of the findings to the way riders perceive risk taking rather than what outcomes may result. The planned follow-up of official crash and offence data for participants (for which they have already consented) will allow this to be examined in the future.

#### **4.2 Conclusion**

The findings are an initial indication that the Transtheoretical Model may offer a useful framework for developing and evaluating rider training interventions targeting risk taking. The incremental change found for adopting a safe riding mindset and subsequent safe riding practices suggests that training can influence the way motorcyclists think about risk taking. The examination of the Transtheoretical Model reported here was undertaken as part of a broader study so operationalisation of all aspects of the model was not undertaken due to questionnaire length. However, a future longitudinal study focussing specifically on the



relationship between the range of variables in the Transtheoretical Model and the link to crash involvement may be worthwhile for rider training based on these findings.

## APPENDIX A

### Questionnaire item for the stages of change

Please tick one of the following statements that best describes you.

- 
- I think there's no point trying to ride safely because I can still get hurt anyway
- 
- I think there are things I should probably do to improve my safety when riding a motorcycle
- 
- I'm ready to start riding as safely as possible in the near future
- 
- I don't do risky things on a motorcycle because I know how dangerous it is
- 
- I've been riding as safely as possible for a long time (6 months or more)
- 

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