THE GEORGE INSTITUTE
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A randomised control trial in the state of Victoria, Australia:

Evaluation of the VicRide on-road coaching program for newly licensed motorcyclists

FINAL Report to VicRoads FEBRUARY 2015

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Executive summary

Background and Aims

In order to examine ways to improve the safety of motorcycle riders, VicRoads funded the development and evaluation of a motorcycle coaching program for newly licensed riders in the Australian state of Victoria. The program was named the 'VicRide on-road coaching program' (VicRide) for the purpose of the trial. The aim of the program was to assist newly licensed riders to become safer riders and to reduce their involvement in risk-taking behaviour and crashes. The George Institute for Global Health (TGI) was commissioned to evaluate the effectiveness of VicRide, primarily to determine its effectiveness in reducing crash rates for novice motorcycle riders in Victoria. The evaluation also considered the program effects on rider behaviours, attitudes, and motivations. A process evaluation was conducted to examine program delivery and implementation.

Methods

Participants and Procedures

The VicRide evaluation was conducted between May 2010 and January 2014 in Victoria. The target population was newly licensed motorcycle riders who had passed the motorcycle operators' test within the previous 12 months and held a restricted[1] motorcycle rider licence. Eligibility criteria also required participants to be the registered owner of a motorcycle (not a scooter) that complied with the VicRoads Learner Approved Motorcycle Scheme. In order to ensure that participants had basic on-road riding competence, they were required to have ridden at least 500km over at least 12 trips on public roads since obtaining their permit.

Potentially eligible participants were identified from the state licence database, as having advanced from a learner permit to a restricted motorcycle licence during the recruitment period of May 2010 – October 2012. Participants were recruited by letters of invitation sent out by VicRoads. Those interested in participating could register and complete eligibility and consent questions on-line or verbally by phone. The consent process included agreeing to linkage of participants' data held by VicRoads on licensing, traffic offences and involvement in crashes reported to police.

VicRide was evaluated through a randomised controlled trial (RCT)[2] with a 12-month follow-up period. Participants completed three surveys via a computer assisted telephone interview over the course of the evaluation study. At the completion of the baseline interview, participants were randomly assigned to either the VicRide group or control group. Those assigned to the VicRide riders were required to book into the program with Honda Australia Rider Training (HART) within six weeks of the baseline interview. Those assigned to the control group were advised that they could take part in VicRide after the evaluation period. Subsequent interviews were conducted at three months (Interview-2) and 12 months

[1] The term "restricted" refers to those riders who, because they have held a motorcycle licence for less than one year, are subject to various restrictions.

[2] Randomised controlled trial (RCT) is a research design where participants are randomly allocated to either an intervention group or a control group. The intervention group is provided with the intervention, in this case VicRide. The control group is not provided with the intervention (at all or not during the evaluation period).

(Interview-3) after the date of VicRide participation for the VicRide group and at similar timeframes after the baseline interview for the control group. All participants who completed the three surveys were provided with a $90 reimbursement from VicRoads. In addition to the $90 reimbursement, those who were randomised to the VicRide group and completed the program within six weeks of the baseline interview were also provided with a $50 reimbursement to cover for their trouble to complete the program in a limited timeframe.

Outcome Evaluation

The phone survey items were sourced or adapted from existing validated and reliable instruments where possible. Items that could not be sourced from existing instruments were devised for the evaluation.

VicRoads provided TGI with the police-recorded crash and offence data identified for the present study sample in August 2014.

All analyses with respect to outcome evaluation were conducted on an intention-to-treat[3] basis. The effectiveness of VicRide was evaluated with respect to various primary and secondary outcomes. In order to maximise the statistical power, composite outcomes of at least one police-recorded or self-reported crash compared to none at 3-month and 12-month follow-up were used as primary outcomes.

Secondary outcomes included the following:

- At least one police-recorded crash, or not at 3-month and 12-month follow-up
- Number of days to first police-recorded crash date from baseline interview date
- Number of police-recorded offences (whilst driving a car or a motorcycle) at 12-month follow-up
- Number of police-recorded offences whilst driving a car (as identified by VicRoads) at 12-month follow-up
- Number of police-recorded offences whilst riding a motorcycle (as identified by VicRoads) at 12-month follow-up
- Number of self-reported crashes at Interview-2 and Interview-3
- Number of self-reported near misses/close calls at Interview-2 and Interview-3
- Composite outcome of at least one self-reported crash or near miss/close call, or not at Interview-2 and Interview-3
- Injury involved in the most serious crash self-reported at Interview-3, or not
- Rider injured in the most serious crash self-reported at Interview-3, or not
- Riding exposure at Interview-2 and at Interview-3 respectively relative to riding exposure at Interview-1
- Scale scores at Interview-2 and at Interview-3 respectively relative to scores at Interview-1 on the following self-reported attitudes:

[3] A statistical analysis method based on an RCT principle that all those individuals randomised into the VicRide group including those who did not actually complete VicRide are still retained in the group to compare with all those randomised into the control group.

  - Optimism bias on the likelihood of being involved in a crash in the next 12 months compared to other riders their age, gender and level of riding experience
  - Unrealistic confidence in own riding skills compared to other riders their age, gender and level of riding experience
  - Crash attributions to drivers
  - Crash attributions to motorcycle riders
  - Safety beliefs in riding
  - Deviant beliefs in riding
- Scale scores at Interview-2 and at Interview-3 respectively relative to scores at Interview-1 on the following self-reported motivations as measured by the Motorcycle Rider Motivation Questionnaire:
  - Convenience
  - Pleasure
  - Speed
- Scale scores at Interview-2 and at Interview-3 respectively relative to scores at Interview-1 on the following self-reported behaviours as measured by the Motorcycle Rider Behaviour Questionnaire:
  - Errors
  - Speeding violations
  - Stunts performance
  - Protective gear use

Although an intention-to-treat analysis which preserves the randomisation of the trialis the most robust form of analysis of a RCT, given a number of riders who were assigned to the VicRide group did not actually complete VicRide, a supplementary sensitivity analysis was performed to estimate the average effect of VicRide for only the VicRide riders who actually completed the program.

Process Evaluation

The VicRide group was asked questions on participant satisfaction with the program and about their experiences of VicRide participation at Interview-2.

The coach training for VicRide delivery was developed by Monash University Accident Research Centre, Learning Systems Analysis and HART. On the last day of the coach training delivered by HART, the coaches were asked to complete an anonymous paper-and-pen survey developed by TGI, providing feedback on the training they received.

The VicRide coaches recorded data on the key delivery components for every participant specified for the evaluation. HART sent these data to TGI at the end of each month until the end of February 2013 in order to monitor the degree of adherence of the actual delivery to the intended program design.

Economic Evaluation

All participants were asked about their willingness to pay for VicRide at Interview-2 and this amount was compared between the two study groups. In the study protocol it was specified that if outcome evaluation showed VicRide to be effective in reducing the number of crashes, then cost-benefit analyses should be conducted.

Summary of Results and Discussion

The VicRide group reported statistically significantly fewer near misses/close calls, more riding hours in an average week, more confidence in riding skills, more attribution of the cause of crashes to riders, and more speeding behaviours than the control group, after accounting for the effects of age, gender, and riding exposure. No other statistically significant results were found. The results of the sensitivity analyses were broadly consistent with the results of the main intention-to-treat analyses.

Whilst the coach and VicRide participant feedback on VicRide were generally positive and the program was delivered as intended, VicRide did not have a statistically significant effect on crashes (self-reported and/or police-recorded), or on time to first police-recorded crash.

Almost 30% of the participants did not complete the preparation activity before they participated in VicRide and this may have negatively impacted the program outcomes. In order to maximise control of the delivery and to cater for all levels of participant motivation all learning opportunities should be contained within the confines of attendance at the program. In addition, of the VicRide group only around 60% completed VicRide even though a $50 reimbursement was provided for VicRide riders who completed the program within six weeks of the baseline interview. The low completion rates of the preparation activity among the VicRide participants and of VicRide itself among the VicRide group suggest training programs such as VicRide are particularly challenging to standardise and implement as a state-wide intervention, at least in the current non-mandatory context.

In addition, VicRide riders were willing to pay a statistically significantly lower amount for VicRide compared to control riders. It is possible that this in part might have been due to the desire expressed by 20% of program completers to have more advanced skill training included; however, the research literature suggests this can increase unrealistic confidence and subsequently increase crash risk and therefore was intentionally not part of the VicRide program.

Given no reductions were made in crashes there is no apparent benefit of VicRide to outweigh the costs of VicRide. As the results do not support further implementation of the VicRide, cost benefit analysis was not conducted.

This study could not clearly demonstrate that the confidence measured in the VicRide group was ‘unrealistic’, only that the level of confidence (unrealistic or not) increased from baseline after program participation. Whether unrealistic or not, confidence may be related to risk taking. Future research may be of value to improve distinct measurement of realistic versus unrealistic confidence and their respective relationship to risk taking.

The current study adopted a highly rigorous evaluation method to overcome many of the methodological limitations of previous evaluation studies of motorcycle rider training programs. Despite the improvement in the evaluation methodology, the present results were consistent with the findings of previous

evaluation studies of both driver and rider training—i.e. no evidence of crash reductions. VicRide may have been successful in improving hazard perception skills (as indicated by fewer near misses at three months), but it was associated with an increase in speeding behaviours.

Recommendations

Recommendations are made based on the results and evidence from the literature.

Caution against particular practices

Recommendation 1: Given no detectable road safety value of VicRide and the numerous barriers to achieve high completion rates for both the preparation activity and program attendance, it is recommended a state-wide roll out of VicRide *not* be pursued as part of obtaining a rider licence or as a voluntary activity.

Recommendation 2: In light of inconsistencies between participants in terms of their compliance with preparation activities before VicRide attendance, it is recommended that if a revised program or any future programs are planned, then no similar pre-program activities should be required. All learning opportunities should be contained within program attendance to maximise control of the delivery and ensure completion to cater for all levels of motivation.

Recommendation 3: Even if there may be a group of riders who are particularly interested in skills training given the risk of increasing unrealistic confidence in riding skills, and subsequently crash risk, it is recommended that future programs continue to have little/no focus on skills training until more evidence is available on the best method to improve skills without increasing confidence, which can lead to increased risk taking and therefore higher crash risk.

Knowledge gaps and future research

Recommendation 4: While VicRide had a particular focus on improving hazard perception skills and deliberately limited focus on vehicle handling skills training, it appears to have resulted in greater confidence in riding skills by the VicRide riders. However, this study could not establish the relative role of confidence in vehicle handling skills versus hazard perception skills in risk taking and crash risks. It is recommended that the respective impact of confidence in vehicle handling skills versus hazard perception skills in risk taking and crash risks be investigated in future research to help improve rider safety programs.

Recommendation 5: Given there remains no evidence for road safety benefits of motorcycle training programs, it is recommended that any future proposed training programs only be implemented in the context of a trial design such as an RCT in relation to the outcomes of unrealistic confidence in vehicle handling skills and hazard perception skills separately, optimism bias for future crash risks, risk taking behaviours and crash outcomes.

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Glossary

Abbreviation	Label	Definition
CATI	Computer Assisted Telephone Interview	A system that allows phone interviewers to follow a computerised script and enter responses directly into a secure electronic database
CV survey	Contingent Valuation survey	A survey-based approach in which individuals of a representative sample of the population at risk are directly asked to value in monetary terms (willingness to pay) a hypothetical reduction in their own and possibly other people's risk resulting from an intervention
GLS	Graduated Licensing System	A system that includes learner and provisional stages before full licensing, providing beginners with the opportunity to first gain experience and acquire critical skills under conditions of reduced crash risk
ITT	Intention-to-treat	A statistical analysis method based on the principle of an RCT where all those individuals randomised into the VicRide group including those did not actually complete VicRide are still retained in the group to compare with all those randomised into the control group. This preserves the randomisation and maintains integrity of the study design.
LAMS	Learner Approved Motorcycle Scheme	A scheme introduced in Victoria in 2008, to limit novice riders' to riding motorcycles from an approved list. Criteria for approval include engine capacity not exceeding 660 ml, power-to-weight ratio less than 150 kW/tonne. Motorcycles may also be excluded if they have been found to be unsuitable for novices such as being over represented in crashes(VicRoads 2008).
MRBQ	Motorcycle Rider Behaviour Questionnaire	A self-report questionnaire that measures risky on-road motorcycle rider behaviours such as errors and violations, originally developed by Elliot et al (2007)
MRMQ	Motorcycle Rider Motivation Questionnaire	A self-report questionnaire that measures reasons for riding a motorcycle, originally developed by Sexton et al (2004)
Poisson	Poisson distribution	Poisson is a discrete probability distribution that expresses the probability of a given number of events occurring in a fixed interval of time and/or space if these events occur with a known average rate and independently of the time since the last event.(Haight 1967)

RCT	Randomised Controlled Trial	A research design where participants are randomly allocated to either an intervention group or a control group. The intervention group is provided with the intervention. The control group is not provided with the intervention
WTP	Willingness to pay	A concept used in economic evaluation that represents the monetary value people are willing to pay for the product being valued

1. Introduction

1.1 Background

Motorcycles have become an increasingly popular form of transport and recreation across Australia since the turn of the century. Between 2001 and 2009, the number of registered motorcycles in Victoria increased by 55% from 95,000 to 147,600 and the number of motorcyclists injured with a high threat to life increased by 70% from 257 to 348 (AIHW 2012). In 2010, VicRoads commissioned Monash University Accident Research Centre (MUARC) to develop an assisted ride program for riders in Victoria in collaboration with Honda Australia Rider Training (HART) and Learning Systems Analysis (LSA). The program utilises a coaching style of delivery rather than a more traditional instructional style and is delivered primarily on-road. The role of the coach is to facilitate riders learning through their own observations and experience (Ormston, Dudleston et al. 2003).

VicRoads initiated a large-scale trial of this newly developed program in Victoria for recently licensed motorcyclists. The program was named the 'VicRide on-road coaching program' (VicRide) for the purpose of the trial. The George Institute for Global Health (TGI) was commissioned to evaluate VicRide primarily to determine its effectiveness in reducing crash rates for novice motorcycle riders in Victoria. The evaluation also considered the program effects on rider behaviours, attitudes, and motivations. A process evaluation was also conducted to examine program delivery and implementation.

1.2 Motorcycle training

Newly licensed riders have a greater risk of crashing than other more experienced riders (Haworth, Kowadlo et al. 2000, Mullin, Jackson et al. 2000). Novice drivers have similarly high crash rates but whereas graduated licensing schemes (GLS) have been found to reduce novice drivers' crash risk, similar success with novice riders has yet to be demonstrated (Haworth and Mulvihill 2005, Shope 2007, Savolainen and Mannering 2008, Daniello, Gabler et al. 2009, Christie 2014). The available evidence for the effectiveness of pre- and post-licence rider training programs to date has been inconclusive due to the poor quality of the available evidence (Kardamanidis, Martiniuk et al. 2010, Christie 2014). This trial aimed to examine the effectiveness of a post-licence rider training program.

1.2.1 VicRide program

The aim of the VicRide on-road coaching program was to assist newly licensed riders to become safer riders and to reduce their involvement in risk-taking behaviour and crashes. VicRide consisted of a series of short rides (15-20 minutes) on a planned route and pre- and post-ride discussions over four hours in a group of up to three newly licensed riders and an experienced riding coach. The route included both rural and urban riding environments, which were selected to expose riders to the types of situations identified as potentially hazardous for motorcyclists. Stops between ride sections were programmed to allow for discussion and review of these situations and how different riders approached them.

VicRide coaches were experienced riding instructors who volunteered for the program and undertook an intensive eight day coach training course to develop their ability to perform the role of a coach and mentor. The coaches' training course and materials were developed as a part of VicRide.

The focus of VicRide was on higher order riding skills including cognitive strategies for safe riding, especially in relation to road craft, hazard perception, motivations and experience. The coaching process was to encourage riders to express their opinions and give feedback to each other. The role of the coach was to facilitate these discussions, intervening only as necessary and by using questions rather than answers to re-focus discussion. At the end of the route, the coach facilitated a final group discussion for the riders to review their own learning from the day and determine what each needed to do to keep improving their safe riding skills.

On enrolling in VicRide, participants were sent an information booklet about the program and prerequisites for their participation. . Prerequisites included becoming familiar with the hand signals to be used by their coach, and completion of a short survey designed to stimulate reflection on their riding experiences to date. Their responses also provided an indicator of their crash risk profile. On the day of the VicRide, participants were required to demonstrate to the coach that their motorcycle was in sound mechanical condition and that they had basic competence in braking, cornering and obstacle avoidance.

1.2.2 Theoretical basis of VicRide

The principles of adult learning theory assert that adults learn most effectively when they are motivated and able to take responsibility for their own learning, when the learning is relevant to their needs and the process utilises their own experience, problem solving, reflecting and reasoning skills (Zepeda, Parylo et al. 2013). A learner-centred approach embodies the principles of adult learning theory by focusing on the learning process and setting up situations in which learners are encouraged to draw on their own experiences and to work collaboratively to resolve problems through discussion rather than relying on answers from an authority. The ‘coaching’ style of teaching as opposed to ‘instructional’ was a critical feature of VicRide.

Insight training is designed to challenge participants’ perceptions of their own skills and risks to re-align them with objective reality. Such training has been identified as relevant to rider/driver training as a means of addressing the overestimation of personal ability (unrealistic confidence) that has been associated with self-reported driving/riding skills by novices, particularly amongst young males (Gregersen 1996, Symmons, Mulvihill et al. 2007, Rowden and Watson 2008). This insight training method also formed the bases of VicRide.

The philosophy of the program’s design was to engage the riders’ own thought processes rather than simply to require them to absorb information, and to empower riders to be actively involved in identifying their own limits, developing their own safe riding strategies and monitoring their own riding behaviour and attitude now and in the long term. It was seen as important that coaches were appropriately trained in order to deliver the program, given the difference between this coaching style approach and more traditional instructional rider training programs.

1.3 Evaluation of VicRide

The main objective of the VicRide trial was to evaluate the road safety benefits of the program in terms of crash involvement, riding behaviour and attitudes of participants. The evaluation also included process evaluation to inform policy decisions and economic evaluation to further justify program implementation should the program prove effective.

TGI conducted a detailed review of the literature on rider training evaluation at the commencement of the contract project with VicRoads to inform the design of the evaluation study (see Appendix 1). The present study was designed to take account of and overcome most of the methodological limitations identified in reviews of previous evaluations of motorcycle training programs.

A major limitation of previous trials of motorcycle safety programs has been the loss of riders who do not progress through the licensing system. Previous US trials found that only approximately 30% of recruited riders holding a learner licence ultimately progressed through to a full licence (Kardamanidis *et al.* 2010). The VicRide trial was designed to avoid this potentially significant source of bias by restricting participants to those already holding a restricted rider licence.

1.3.1 Randomised Controlled Trial

VicRide was evaluated through a randomised controlled trial (RCT)[4]. RCT designs are the gold standard for evaluations, as although they do require significant resources, they also provide the highest quality of evidence for the success or lack of success of an intervention (Evans 2003, NHMRC 2009).

In an RCT, participants are randomly allocated to either an intervention or control group. The intervention group is provided with the treatment, in this case VicRide. The control group was not provided with the treatment, but were told it would be available for them at the completion of the trial. The aim of random allocation is to ensure that any other factors that may influence the outcome are evenly distributed across the intervention and control groups and therefore effectively controlled. This includes measurable factors (e.g. age or riding exposure), as well as other potential confounders that are either difficult to measure or unknown (e.g. motivation to ride safely). An essential tenet of an RCT is to compare all those who were randomly assigned to the intervention group with all those who were randomly assigned to the control group in order to avoid bias from non-random attrition of participants from the study (Fisher L, Dixon D et al. 1990). The analysis that delivers this methodological value of an RCT is the intention-to-treat analysis. This means that even those individuals in the intervention group, who fail to complete the program, are still retained in the group for the purpose of the analysis. As long as the randomisation has been conducted effectively, the only difference in outcomes between the intervention and control groups will be attributable to the treatment (i.e. VicRide).

The RCT methodology was identified as the most appropriate method to evaluate VicRide, because a robust randomisation process effectively controls for selection bias, which has been the primary limitation of previous evaluation studies of motorcycle training programs. Selection bias refers to the bias introduced by participants self-selecting to complete an intervention. There is evidence that individuals who choose to take motorcycle training differ from those who do not (Anderson, Ford et al. 1980, Mortimer 1984, Kardamanidis, Martiniuk et al. 2010) such that any effects shown in the comparison of participants and non-participants, do not reflect program effects but already existing differences between the two groups of individuals (i.e. those who choose to complete a rider training program are already motivated to ride safely).

[4] This RCT was registered on 10th May 2010 with the Australian New Zealand Clinical Trial Registry: ACTRN12610000372088 http://www.ANZCTR.org.au/ACTRN12610000372088.aspx

This relates to the importance of intention-to-treat analyses as opposed to comparing just those who completed the program with those who did not, which potentially invites bias. The reasons for not completing the program may be significantly related to the safety outcomes with which the evaluation is concerned. For example, those who choose to complete the program may be inherently concerned with safety and that is why they are motivated to complete the program. Therefore, the final effects found by comparing just those who completed the program with those who did not may simple reflect the existing characteristics of those riders who chose to complete the program and not the effects of the program itself—a biased result.

A limitation of RCTs relates to the ethical dilemma of denying the benefits of a potentially effective intervention to those participants assigned to the control group. This was overcome in this study as, following randomisation, those assigned to the control group were offered the opportunity to undertake VicRide after their role in the study was completed. Other possible risks of RCTs include failure to provide the intervention as intended, attrition of participants during the trial, and inadequate randomisation. The built-in process evaluation was intended to facilitate quality control of the program delivery in the current design. Generous reimbursements were provided to study participants in an effort to minimise attrition. Extensive data were also collected at baseline to allow assessment of the effectiveness of randomisation in the current study.

1.3.2 Participant characteristics

The review of the literature identified a range of factors that have been found to be associated with motorcycle crash risk and that were therefore potential confounders of the intervention effect. Baseline data on these characteristics were collected during an initial interview before randomisation into the intervention or control group and in two follow-up interviews.

Basic demographic variables were collected in order to describe the study population. This information was critical not only to ensure the randomisation was successful (i.e. similar baseline characteristics between the intervention and control groups) but also to allow for the statistical control of confounding factors that may be linked with outcomes of interest (e.g. attitudes and crashes). Although ,confounding in an RCT is effectively designed out by the study design, it is also important to collect data on important confounding variables to ensure the effects can be confidently attributed to the intervention.

Age is consistently identified as a key predictor of crash risk for motorcyclists (Rutter, Quine et al. 1995, Haworth, Mulvihill et al. 2002, Harrison and Christie 2005). Although crash risk appears to be modified with increasing experience, it is apparent that youth remains a predictor even when the effects of experience are controlled (Mullin, Jackson et al. 2000; Haworth, Mulvihill et al., 2002; Sexton, Baughan et al., 2004; Lin and Kraus, 2009). The majority (90%) of riders and the majority of motorcycle casualties in Australia are male (ATSB 2004). There is conflicting evidence about whether females have higher or lower crash risk than males (Lardelli-Claret, Jimenez-Moleon et al. 2005, Chang and Yeh 2007), but also evidence that gender differences are not significant when distance travelled is taken into account (Sexton, Baughan et al. 2004). While evidence may lack for gender to be a predictor of crash risk for motorcyclists, there is potential for gender to be a confounder in the evaluation due to differences in the ways males and females assimilate tuition and in the ways they perceive risk (Nyberg and Gregersen 2007, Frings, Rose et al. 2012, Glendon, McNally et al. 2014).

Various indicators of socio-economic status (SES) such as income, occupation and educational level have been associated with injury, particularly in motor vehicles crashes (Cubbin, LeClere et al. 2000, Laflamme, Engstrom et al. 2004, Zambon and Hasselberg 2006, Chen, Ivers et al. 2009) and therefore were also included.

Prior riding experience and exposure need to be taken into account when determining how much change may be attributed to an intervention. Determining the role of experience in rider development is also complex because increased experience equates to increased risk exposure but not necessarily to improved safety skills (Hosking, Liu et al. 2010, Bellet and Banet 2012, Crundall, Van Loon et al. 2013). Definitive measures of experience are also difficult to quantify, due to different types of experience. For example, riding the same route daily over many years would not equate to riding the same distance in a variety of traffic conditions. Accordingly, experience was measured in years and distance ridden but also took into account riding conditions, types of journey, frequency (daily, weekends, summer or fine weather etc.) and consistency over time. In addition, a high proportion of new riders (81%) already have a driver licence and so might be expected to have an advantage from on-road experience of traffic environments (de Rome, Ivers et al. 2010). Many novice riders have had pre-licence experience riding off-road and on-road or have previously held learner licences, but whether such experience is protective has not been established (Taylor and Lockwood 1990, Mullin, Jackson et al. 2000, Lardelli-Claret, Jimenez-Moleon et al. 2005, de Rome, Ivers et al. 2010). Therefore, these additional forms of experience were therefore also taken into account.

Measures of exposure generally relate to frequency of riding, distances travelled and hours ridden, however risks also vary according to the types of roads used and the journeys undertaken (Sexton, Baughan et al., 2004). Other factors associated with exposure include type of bike (engine capacity and class) and type of riding (e.g. recreational, commuting) and types of road (rural, urban) have also been associated with different levels of crash risk although the nature of the association is unclear (Haworth, Mulvihill et al. 2005, Haworth and Mulvihill 2005, de Rome, Ivers et al. 2010).

Social involvement in motorcycling has been identified as a potential confounder of the outcomes of interest in the evaluation. There is evidence that involvement in motorcycling as a part of an individual's identity, for example, as a member of a motorcycle club, may be a predictor of the intention to speed, if speeding is perceived to be a group norm (Elliott 2010).

1.3.3 Outcome evaluation

Outcome evaluation refers to the examination of the effectiveness of an intervention. The key outcome of interest for the evaluation of VicRide was crash involvement. Police-recorded crashes were identified through data linkage to participants' motorcycle licences. However police reports do not capture all crashes, and motorcycle crashes are known to be substantially under reported (Amoros, Martin et al. 2006, Richardson and Paini 2006, Broughton, Keigan et al. 2010). Therefore, data on police-recorded crashes were supplemented by self-reported crashes in the follow-up surveys included. Other outcomes assessed included police-recorded offences, self-reported near misses, riding exposure and self-reported behaviours, attitudes, and motivations all of which are related to crash risks. These are explained below.

Sexton et al (2004) developed a 43-item Motorcycle Rider Behaviour Questionnaire (MRBQ) to identify behavioral factors influencing motorcyclists' crash risk. In a large scale survey of UK motorcyclists, they

found evidence that risk taking behaviour (errors, speeding, stunts, non-use of protective gear) was predictive of crashes, when age, experience and exposure were taken into account. The MRBQ was included to evaluate one of the main aims of VicRide - to reduce risk taking behaviours.

The Crash Attribution Scale (Mulvihill and Haworth 2006) measures the extent to which motorcyclists attribute causes of crashes to driver errors (driver attribution) versus motorcyclist errors (motorcyclist attribution). There is suggestion that causal attribution of crashes to motorcyclists versus drivers may influence their subsequent risk taking behaviours and thus crash risks (Lin, Huang et al. 2004). These scales were used to assess the impact of the insight learning focus of VicRide, which was designed to help riders reflect on the rider behaviours that might lead to crashes.

VicRide used an insight training approach, which focused on calibrating participants' perceptions of their own skills and risks with objective reality rather than teaching them vehicle-handling and manoeuvring skills (Rowden and Watson 2008). The aim of insight training is to reduce optimism bias for future crash risks, thereby targeting issues of unrealistic confidence in their own skills (Senserrick and Swinburne 2001). Optimism bias refers to the tendency of people to over-rate their own chances of positive future events and under-rate chances of negative future events compared to other people similar to themselves (Weinstein 1989). In this instance the focus was on underrating chances of crashes compared to riders of their age, gender and with the same level of riding experience—optimism bias for crash risks.

Unrealistic confidence refers to the finding that people generally believe that they are better at various common behaviours than average such as driving (Svenson, Fjschoff et al. 1985, Dalziel and Job 1997). Concepts of optimism bias and unrealistic confidence are closely related in that greater confidence in riding skills logically allows for a belief in reduced risk for crashing and there is evidence that optimism bias about future risks is related to perceptions of personal abilities rather than genetic or environmental factors (Weinstein 1984). Unrealistic confidence in riding skills is indicated by a stronger belief that they have better riding skills than average compared to riders of their age, gender and with the same level of riding experience. The evaluation therefore included measures of optimism bias for being involved in a crash and a measure of unrealistic confidence in riding skills to assess any impact of participation in VicRide.

An evaluation of the UK National Ride Scheme, which was a police-led diversionary program for motorcyclist offenders, identified responses on two scales about safety and deviant beliefs about safe riding that were reflective of change in attitudes to road rule compliance (Burgess, Broughton et al. 2010). These scales were included to evaluate one of the aims of VicRide which was to develop safety attitudes.

The reasons people choose to ride motorcycles (such as the thrill of riding and an enjoyment of speed) have been identified as potential contributors to crash risk (Reeder, Chalmers et al. 1996, Haworth, Smith et al. 1997, Sexton, Baughan et al. 2004, Elliott, Baughan et al. 2007, Watson, Tunnicliff et al. 2007). VicRide includes reflections on motivations for riding in the curriculum. Sexton et al, developed the Motorcycle Rider Motivation Questionnaire (MRMQ) to assess rider motivations, identifying three underlying factors – pleasure motives, speed motives and convenience/economic motives (Sexton, Baughan et al. 2004). The MRMQ was also included to evaluate a component of VicRide.

Measures of riding exposure were also used as an outcome measure because previous research has shown participation in motorcycle training programs can influence subsequent riding exposure (Ormston, Dudleston et al. 2003) and increased riding exposure increases the exposure to risk of a crash.

1.3.4 Process evaluation

The judgment as to the effectiveness of the program was also contingent on whether it was delivered as intended by the program developers. The process evaluation was conducted in parallel with the outcome evaluation and designed to distinguish between outcomes due to inherent program efficacy and outcomes due to the implementation quality. A program may be found to be ineffective because the program is inherently ineffective or the program could be inherently effective but its implementation is poor.

The process evaluation was also devised to assist in interpreting the findings from the outcome evaluation and in making decisions about the future of the program, its roll-out to other areas and any adjustments that should be made to its content and delivery. Its scope covered all aspects of the implementation, including the coach training and the VicRide delivery. The objective was to identify those aspects of the implementation that occurred as intended and those that did not. Sources for this evaluation were the coaches, data collected by HART on the key VicRide delivery components, and the VicRide participants.

1.3.5 Economic evaluation

If VicRide is shown to be effective in reducing motorcycle crashes, cost-benefit evaluation can further inform the value of adopting it as an ongoing program. An intervention may be effective, but may be too costly to implement and the limited resources may be better spent on alternative effective interventions, potentially including those of lower costs. Therefore cost-benefit evaluation supplements the decision making process when the outcome evaluation shows the intervention to be effective.

In the case of VicRide, cost-benefit analyses involves the calculation of ratios of program implementation costs (i.e. administration, training and delivery costs) and the potential savings from reduced crashes due to VicRide. If VicRide is effective in reducing crashes and the crash savings are larger than the costs then it is in principle a worthwhile road safety intervention. However, cost-benefit analysis is only meaningful if the program is found to be effective.

Study participants' willingness to pay for VicRide can also be a measure of how much motorcyclists value the program and may inform the program price if it were to be implemented.

1.4 Summary of aims and objectives of the evaluation

The primary objective of the evaluation was to determine the effectiveness of VicRide in achieving the program aims of assisting newly licensed riders to become safer riders and reducing their involvement in risk-taking behaviour and crashes.

The evaluation was also concerned to determine the cost-benefit of the program in order to further justify program implementation should the program prove effective. Willingness to pay for the program was also intended to inform policy decisions on program implementation if it were effective.

In summary, the evaluation consisted of three parts:

1. Outcome evaluation to assess the effectiveness of VicRide in terms of:

    - Police recorded crashes;
    - Police recorded offences;
    - Self-reported
        - Crashes;
        - Near misses/close calls;
        - Attitudes (crash attribution, optimism bias, safety beliefs scales);
        - Riding behaviours;
        - Riding motivations;
        - Riding exposure.

2. Process evaluation to assess the implementation of the program. Elements included:

    - Coach feedback on the Coach training program and VicRide;
    - VicRide delivery by HART;
    - VicRide Participant feedback.

3. Economic evaluation to assess the monetary value of the program. Elements included:

    - Cost-benefit analysis to assess the value of implementing VicRide as an ongoing program if it is shown to be effective in reducing crashes;
    - Willingness to pay for VicRide as a measure of how much motorcyclists value the program and of program price if it were effective and to be implemented.

2. Methods

The VicRide evaluation was conducted between May 2010 and January 2014 in Victoria.

2.1 Participants and Procedures

2.1.1 Target group and recruitment

The target population was newly licensed motorcycle riders who had passed the motorcycle operators' test within the previous 12 months and held a restricted motorcycle rider licence. Eligibility criteria also required participants to be the registered owner of a motorcycle (not a scooter) that complied with the VicRoads Learner Approved Motorcycle Scheme (LAMS). Under this scheme, approved motorcycles are limited to an engine capacity of no greater than 660cc, but not exceeding a power-to-weight ratio of 150

kilowatts per tonne. In order to ensure that participants had basic on-road riding competence, they were required to have ridden at least 500km over at least 12 trips on public roads since obtaining their learner permit.

Potentially eligible participants were identified from the state licence database, as having advanced from a learner permit to a restricted motorcycle licence during the recruitment period of May 2010 – October 2012. Participants were recruited by letters of invitation sent out by VicRoads. These invitation letters included all the requirements of participation and information on what the program participation entailed. Those interested in participating could register and complete eligibility and consent questions on-line (as set up by MUARC) or verbally by phone when called by interview staff subcontracted by TGI. The consent process included agreeing to linkage of participants' data held by VicRoads on licensing, traffic offences and involvement in crashes reported to police.

Participants were originally recruited by mail and website only but as recruitment was slow, methods were adjusted to also include interviewers calling riders after mail outs from October 2010. VicRoads provided TGI via a password-protected secure FTP network with the phone numbers of all the potentially eligible participants to whom VicRoads had sent out letters of invitation. A month from the mail out date was allowed for riders to sign up online. After a month the phone numbers of those who had not yet signed up online were sent to the Survey Research Centre (SRC), Edith Cowan University who were subcontracted by TGI to conduct the phone recruitment as well as the survey interviews. MUARC sent the website recruitment data and the SRC sent the phone recruitment data to TGI weekly and the TGI Project Manager cross-checked the data weekly to ensure that no duplication of recruitment via online and phone occurred. When no new recruits were achieved any longer via online or by phone, new samples were identified by VicRoads and the aforementioned process was repeated until the target of 2400 riders were recruited.

All the data transfers with SRC and MUARC to and from TGI were conducted through a password-protected secure encryption software (MessageLock) purchased by TGI.

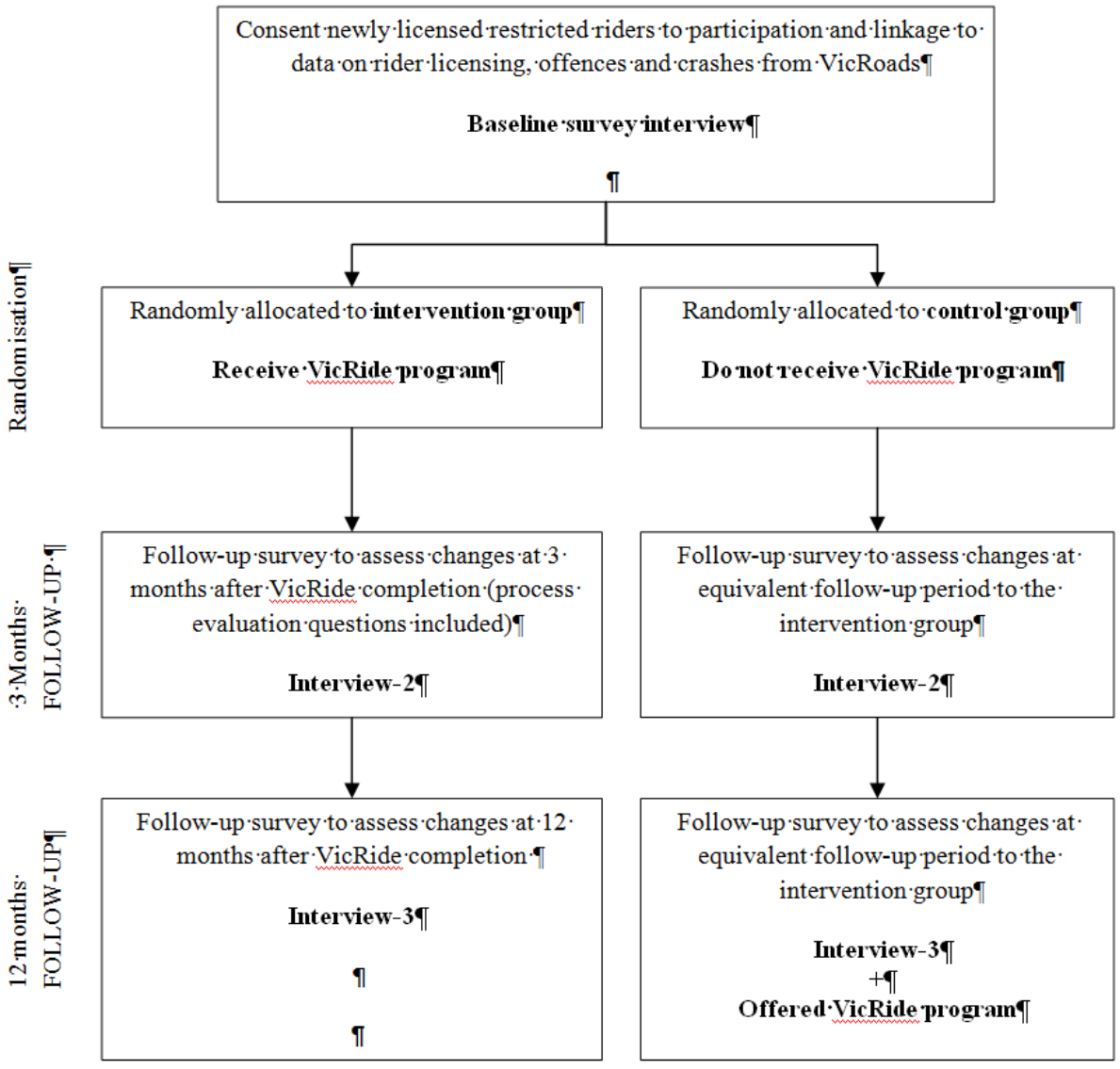
2.1.2 Sample size

Sample size calculations assumed a composite crash outcome (at least one police-recorded crash or self-reported crash) of 22% in the control group and a 25% reduction in crash outcomes for those who completed the program. These estimates were based on previous studies reporting crash rates in novice motorcyclists and novice drivers (Haworth, Smith et al. 1997, Boufous, Ivers et al. 2010). Based on these figures, a study with 1,020 riders in each group was calculated to have 88% statistical power (α=0.05) of detecting an absolute reduction of 5.5%. By adjusting with a conservative study drop-out rate of 15%, 2400 riders needed to be recruited into the study.

2.1.3 Evaluation study design and procedures

The evaluation design and procedure is summarised in a flow diagram in Figure 1.

Figure 1. VicRide evaluation design and procedure



2.1.3.1 Phone survey interviews

Participants completed three surveys via telephone interviews over the course of the evaluation study. A computer assisted telephone interview (CATI) system was used to conduct the interviews. See Appendices 2.1, 3.1 and 4.1 for copies of the three interview schedules.

The first interview (baseline) was conducted as soon as possible following recruitment. Professional telephone interviewers from the SRC, Edith Cowan University who were subcontracted by the TGI were

provided with up to three telephone numbers (home, work, and/or mobile) of those riders who had registered and provided their consent to take part in the study. Interviewers called the participant to conduct the interview or make an appointment for a more convenient time. Interviewers called each participant up to 10 times or until refusal to participate was made, whichever occurred earlier, to ensure a high response rate. Participants' responses were entered directly into an electronic database during the interview, reducing the costs, errors, and inefficiencies of secondary data entry. Around 50 telephone interviewers were trained by the TGI research team before study commencement.

At the completion of the baseline interview, participants were randomly assigned to either the intervention (VicRide group) or control groups (non-intervention) and advised of their status. A randomisation algorithm was applied within the CATI system. Those assigned to the control group were advised that they could take part in VicRide at the completion of the final interview in about 12 months' time. All riders were provided with a phone number for the program delivery organisation of HART and a reference number for them to use when booking with HART. VicRide riders were to call and book with HART within six weeks of the baseline interview and control riders were offered to call and book with HART after completing the final interview. TGI also sent these reference numbers weekly to HART at a maximum of one week lapse since the baseline interview completion date to ensure that HART was booking in only VicRide riders who had completed the baseline interview (but not the two follow-up interviews) and control riders who had completed all three interviews. With the reference numbers TGI also provided HART with the baseline interview date and contact details of the VicRide riders so that they could call the riders for booking into the program if the riders had not called after a week since the baseline interview date. Subsequent interviews were conducted at three months (Interview-2) and 12 months (Interview-3) after the date of VicRide participation for the VicRide group and at similar timeframes after the baseline interview for the control group.

All participants who completed the three surveys were provided with a $90 reimbursement from VicRoads. At the verbal consent of the participants given at the end of Interview-3, TGI sent the address details to VicRoads and they sent a thank you letter with a barcode to the participants. With this barcode participants were able to claim $90 worth of cash or gift cards available at Australia Post.

In addition to the $90 reimbursement, those who were randomised to the VicRide group and completed the program within six weeks of the baseline interview were also provided with a $50 reimbursement to cover for their trouble to complete the program in a limited timeframe. This reimbursement was organised by MUARC and VicRoads.

2.1.3.2 Self-reported measures

The phone survey items were sourced from or adapted from existing validated and reliable instruments where possible. Items that could not be sourced from existing instruments were devised for the evaluation. These included items relating to riding and training history, pre-licence on-road and off-road riding, whether their bike complied with the learner approved motorcycle scheme (LAMS), and exposure in terms of the number, frequency and type of trips.

The majority of items on participant characteristics relating to rider and exposure factors were taken from a number of key studies, these were: type of bike (Haworth and Mulvihill 2005, de Rome, Ivers et al. 2010) riding exposure (Sexton, Baughan et al. 2004, Haworth and Mulvihill 2005, Jamson, Chorlton et al.

2005), off-road/pre-licence, club membership, solo/group riding (de Rome, Ivers et al. 2010) riding licence status (Haworth and Mulvihill 2005) motivations for riding (de Rome, Ivers et al. 2010). Various exposure measures were employed: 1) self-reported odometer reading on the participant's motorcycle (Q7 in Appendix 2.1); 2) self-reported number of kilometres participants have ridden in a lifetime (Q8 in Appendix 2.1); 3) self-reported number of kilometres and hours participants ride in an average week (Q9 and Q10 in Appendix 2.1); 4) self-reported number of on-road riding trips in the past month for various purposes including commuting; as part of a job; recreational; general transport (Q11 in Appendix 2.1) and in different conditions including in dark; rain; heavy traffic; on local suburban roads; winding rural roads; roads of 100km/hour or more speed zones; in the company of at least one rider (Q12 in Appendix 2.1). A trip to one destination and a trip from that destination were counted as two separate trips.

The original MRBQ consisted of 43 items with five scales of traffic errors, control errors, speed violations, stunts, and safety equipment (Elliott, Baughan et al. 2007). The items for each scale are shown at Q27-Q31 in Appendix 2.1. Respondents were asked to rate on a 6-point scale from 'never' to 'nearly all the time' how often they display the behaviour described while riding. Scale scores were calculated from the sum of item responses divided by the number of items in the scale, hence all the scale scores ranged from one to six. For all the scales, higher scores indicate more frequent display of the behaviour described. For the purposes of the evaluation, the MRBQ was validated in an initial set of the VicRide participants and were found to have four scales (Sakashita, Senserrick et al. 2014). The MRBQ used for the present evaluation therefore consisted of 33 items and those four scales were errors, speeding violations, stunts, and protective gear use.

The MRMQ consisted of 24 items divided into three sub-scales; speed, pleasure, convenience (Sexton, Baughan et al. 2004). The items for each scale are shown at Q32 in Appendix 2.1. The respondents were asked to rate on a 5-point Likert scale from strongly disagree to strongly agree with statements about the reasons and importance of motorcycling. For all the scales higher scores indicate they strongly agree with the statement. The MRMQ was also validated in an initial set of the VicRide participants, which were consistent with the existing three scales, speed, pleasure and convenience but the modelling reduced the number of items to 20 (Sakashita 2013). The MRMQ scales used for the present evaluation were speed, pleasure and convenience based on the 20 items.

Two other scales were also sourced from Sexton et al (2004), relating to unrealistic confidence and optimism bias. Riders' assessment of their own level of riding skills compared to other riders of their age, gender, and riding experience was measured by the four-item scale of unrealistic confidence in riding skills (Q26 in Appendix 2.1). Riders' assessment of their own likelihood of being involved in a crash compared to other riders of their age, gender, and rising experience was measured by the one-item scale of optimism bias for crashes (Q25 in Appendix 2.1). Comparing yourself to peers in these questions is logically essential to measure the psychological effects of optimism bias and unrealistic confidence (Weinstein 1984, Svenson 1981).

The crash attribution measure was also sourced from Sexton et al, (2004). The items for each scale are shown at Q24 in Appendix 2.1. The respondents were asked to rate on a 5-point Likert scale from strongly disagree to strongly agree with statements about whether motorcycle crashes are caused by riders' or car drivers' actions. It consists of seven items with two scales, crash attribution to drivers and crash attribution to motorcycle riders.

The safety beliefs measure consisting of two scales, safety beliefs and deviant beliefs, asked respondents to rate on a 5-point Likert scale from strongly disagree to strongly agree with statements about risk taking and non-compliance with road rules. This was sourced from Burgess et al, (2010) and consists of nine items. The scale has previously been found to discern change following a motorcycle traffic offenders program in the UK (Burgess, Broughton et al. 2010). The items for each scale are shown at Q33 in Appendix 2.1.

Study participants were asked to report the number of near misses or close calls while riding on a public road in the last 3 months (Q34 in Appendix 2.1). These were defined as incidents when they almost had a crash but did not. They were also asked to report the number of motorcycle crashes including minor 'spills' or 'offs' while riding on a public road in the last 12 months (Q36 in Appendix 2.1). Motorcycle crashes were defined as collisions with someone or something, or coming off the motorcycle but excluding dropping or knocking the motorcycle over while parked.

All these questions were repeated at the second interview (Interview-2 – see Appendix 3) and final survey interview (Interview-3 – see Appendix 4).

At Interview-2, all participants were also asked to complete a contingent valuation (CV) survey. CV surveys are one of the standard tools used to measure willingness to pay (WTP) and are considered a standard measure of benefit in cost-benefit analyses (Drummond, Sculpher et al. 2005).

The CV survey was designed in accordance with the recommended CV applications (Arrow, Solow et al. 1993). The beginning of the question presented the decision-making context (motorcycle crashes are a serious issue), the nature of the training program (e.g. duration, contents), its provision (delivered by commercial training providers but managed and coordinated by government for riders' voluntary participation), payment vehicle (out-of-pocket and separate from the licence fee), and the hypothetical outcome of the training (number of reductions in motorcycle related deaths and serious injuries), all of which were relevant if VicRide was to be implemented in practice.

This introduction was followed by a question to elicit the WTP for VicRide using the bidding format to cover a wider range of values rather than one nominated value. The upper and lower ends of the seven bids (25, 50, 100, 150, 200, 300, 500 or more) in Australian dollars ($) were based on focus group results (VicRoads 2007). Participants were selected at random for the bids to be presented in either increasing order from the initial bid of $25 to half the sample, or decreasing order from the initial bid of $500 or more to the other half. The highest accepted bid was taken as the respondent's final maximum value in the decreasing order, and the amount that was accepted just before the rejected bid in the increasing order. Respondents were further asked how much they were willing to pay in an open-ended question if they rejected the lowest bid of $25 or lower, or if they accepted the highest bid of $500 or more.

After the final WTP value was elicited, all the study participants were asked the level of certainty in the value they provided on a scale from one indicating 'not certain at all' through to 10 indicating 'absolutely certain'. This was to ensure the validity and reliability of the WTP elicited. A low certainty level can indicate that an erroneous value was provided in a hypothetical survey context (Blumenschein, Johannesson et al. 2001, List and Gallet 2001), and those responses could be exculded from further analyses. All study participants were also asked the main reason for their WTP choice. There were nine pre-set response categories for the main reason. A willingness to pay of zero was determined as a protest

response (Carson, Flores et al. 2001, Dalmau-Matarrodona 2001) if the reason for their choice of zero reflected their outright refusal to pay in-principle (e.g. "It's something the Government should pay, not me"; "It should be free for everybody"; "I have already paid to get my licence"). The whole CV survey was piloted to ensure that the questions were understandable (Sakashita, Jan et al. 2014).

At Interview-2, the VicRide group only were also asked questions for the process evaluation. They were asked 16 questions about their VicRide experience with a four-point rating scale (strongly agree; agree; disagree; strongly disagree) to assess overall participant satisfaction with the program. This produced a total satisfaction scale from one to four with higher scores indicating higher satisfaction with VicRide. Open-ended questions were also used for some questions about the experiences of VicRide participation because VicRide is a new program that was trialled for the first time and it was not possible to pre-categorise possible responses.

2.1.3.3 Reliability of the self-reported measures

With respect to the self-reported attitude, behaviour, and motivation scales, their reliability was examined with the current study sample.

Cronbach's alpha score can range from 0 to 1.0, where a minimum of .70 is required for a scale to be considered reliable. The reliability scores are shown in Table 1. Cronbach's alpha scores can only be calculated for scales with two or more items. Therefore, the alpha score for the one-item optimism bias scale for crashes was not calculated.

Table 1: Reliability of the self-reported attitude, behaviour, and motivation scales

Measure	Baseline	Interview-2	Interview-3
Unrealistic confidence for riding skills	.78	.80	.81
Crash attribution scale – Driver attribution	.56	.57	.56
Crash attribution scale – Rider attribution	.35	.37	.43
Safety beliefs scale – deviant beliefs	.73	.77	.76
Safety beliefs scale – safety beliefs	.59	.60	.61
MRBQ – errors	.79	.81	.82
MRBQ – speeding behaviours	.80	.81	.82
MRBQ – stunts	.64	.65	.68
MRBQ – protective gear use	.48	.51	.50
MRMQ – pleasure	.75	.76	.77
MRMQ – speeding motivations	.75	.78	.79
MRMQ – convenience	.68	.70	.69

The results indicate the two crash attribution scales (driver attribution and rider attribution), the safety beliefs scale, the stunts and protective gear use scales of the MRBQ, and marginally the convenience scale of the MRMQ have questionable reliability in the present study sample. The errors and speeding behaviours of the MRBQ and unrealistic confidence in riding skills had particularly good reliability in the present study sample. The reliability of the MRBQ and MRMQ in the novice rider population is consistent with the previous studies (Sakashita, Senserrick et al. 2014, Sakashita 2013).

2.1.3.4 Police-recorded offences and crashes

All participants provided consent for TGI to have access to their crash and driving and riding offence records held by VicRoads. Whilst the licence number was the key linking variable to identify police-recorded crashes and offences, some licence numbers were invalid or missing. Therefore, other identifiers of first and last names, date of birth and gender were also necessary. At the end of the trial TGI provided VicRoads with the licence number, first and last names, date of birth, and gender of each participant, which were collected during recruitment and baseline interviews. The earliest and the last licence issue dates (also collected during baseline interviews) in the total study sample (February 2009 to September 2012) were also provided to VicRoads to assist the search for crash and offence records. Hence deterministic (based on licence number) and probabilistic (based on other identifiers) data linkage methods were used depending on the availability of identifying variables to maximise the data.

VicRoads provided TGI with the police-recorded crash and offence data identified for the present study sample in August 2014. Most police-recorded crashes and especially offences are likely to be entered in the VicRoads database after on average of six months from the event. Therefore, data linkage at 1.5 year after the last program delivery in January 2013 maximised the identification of the all the crashes and offences in the 12-month follow-up period.

The crash and offence dates were employed to identify the crashes and offences that occurred in the 3-month and 12-month follow-up periods for all participants. The offence data also identified offences that occurred whilst driving versus riding (but some were unknown), allowing analyses of effects on offences overall, car offences, and bike offences respectively.

2.1.3.5 Coach training and survey

The training curriculum for the coaches to deliver the VicRide on-road assisted rides program was developed by MUARC, LSA, and HART. HART independently delivered the coach training. On the last day of the coach training, the coaches were asked to complete an anonymous paper-and-pen survey developed by TGI (Appendix 5). Each coach put the completed survey in an envelope and handed it to the HART trainer of the coaches. HART then sent all the completed surveys in the envelopes to TGI by mail.

2.1.3.6 VicRide delivery data recorded by HART

The aim of the VicRide delivery data collection by HART was to monitor the degree of adherence of the actual delivery to the intended program design. The coaches were required to record data on the key delivery components of VicRide for every participant specified for the evaluation (Appendix 6). These data were sent to TGI at the end of each month. The last VicRide delivery data for the VicRide group were sent to TGI at the end of February 2013, on which the final results are based.

2.2 Statistical analyses

Before any statistical analyses were undertaken, data cleaning and screening were conducted to determine outlier and missing data on a case by case basis for all variables. Missing data occurred when riders refused to provide a response or voluntarily reported they did not know the answer. However, the proportions of refusal and ‘don’t know’ responses were small at less than 1% for all the variables.

Therefore no attempt was made to replace the missing data, and missing data were excluded in the final analyses.

All significance tests were based on the conventional cut-off of $\alpha = 0.05$, i.e. any results with a p-value of less than 0.05 were considered statistically significant.

Prior to the analyses being undertaken a statistical analysis plan was developed and approved by the research team.

2.2.1 Descriptive characteristics of study participants

Descriptive characteristics were reported by the study group and total participants. Categorical variables were summarised by frequencies and percentages. Percentages were calculated according to the number of participants for whom data were available. Continuous variables were summarised by use of standard measures of central tendency and dispersion using mean and standard deviation as well as minimum and maximum values and quartiles where appropriate.

2.2.2 Outcome evaluation

All analyses with respect to outcome evaluation were conducted on an intention-to-treat basis as explained above. The effectiveness of VicRide was evaluated with respect to various primary and secondary outcomes. These are described below.

2.2.2.1 Primary outcome evaluation

In order to maximise the statistical power, the following two composite outcomes were used to evaluate the effectiveness of VicRide in terms of road safety benefits:

1. Composite outcome of at least one police-recorded or self-reported crash at 3-month follow-up, or not (binary outcome: coded 0 for none, 1 if any)

2. Composite outcome of at least one police-recorded or self-reported crash at 12-month follow-up, or not (binary outcome: coded 0 for none, 1 if any)

That is, if either of the following applied, the rider was considered to have had a crash:

- At least one police-recorded crash within respectively three and 12 months from the program completion date for the VicRide group (the average follow-up period was then calculated in reference to the baseline interview date), and at least one police-recorded crash within the average follow-up period from the baseline interview date for the control group, OR

- At least one self-reported crash at respectively Interview-2 and Interview-3.

Differences in the number and proportion of the primary outcomes were compared between the two groups by using standard logistic regression. Time to follow-up (i.e. days between baseline and Interview-2, and days between baseline and Interview-3) was included as an offset variable in the logistic regression model because the length of time to follow-up (that is time of exposure to risk) can also impact the probability of a crash. Odds ratio and 95% confidence interval as well as adjusted odds ratio with the

three pre-specified covariates age, gender, and riding exposure were reported because the three variables are common risk factors for crashes (Blockey and Hartley 1995, Özkan, Lajunen et al. 2006, de Winter and Dodou 2010). Riding exposure was measured through self-reported kilometres and hours of riding in an average week, and number of riding trips in the past month. Amongst them, hours of riding in an average week was found to be most reliable among the present novice rider study sample (Sakashita, Senserrick et al. 2014). Moreover, the current data on kilometres per week had more 'don't know' cases than hours per week at all three time points (45 versus 12 on average across the three time points), reflecting respondents' greater confidence with providing hour estimates than kilometre estimates. Hence hours of riding was used as the measure of riding exposure in all analyses for this study.

2.2.2.2 Secondary outcome evaluation

Other outcomes associated with the VicRide objectives of assisting newly licensed riders to become safer riders and to reduce their involvement in risk-taking behaviour and crashes were secondary outcomes:

- At least one police-recorded crash, or not at 3-month and 12-month follow-up (binary outcome: coded 0 for none, 1 if any)
- Number of days to first police-recorded crash date from baseline interview date
- Number of police-recorded offences (whilst driving a car or a motorcycle) at 12-month follow-up
- Number of police-recorded offences whilst driving a car (as identified by VicRoads) at 12-month follow-up
- Number of police-recorded offences whilst riding a motorcycle (as identified by VicRoads) at 12-month follow-up
- Number of self-reported crashes at Interview-2 and Interview-3
- Number of self-reported near misses/close calls at Interview-2 and Interview-3
- Composite outcome of at least one self-reported crash or near miss/close call, or not at Interview-2 and Interview-3 (binary outcome: coded 0 for none, 1 if any)
- Injury involved in the most serious crash self-reported at Interview-3, or not (binary outcome: coded 0 for none, 1 if any)
- Rider injured in the most serious crash self-reported at Interview-3, or not (binary outcome: coded 0 for none, 1 if any)
- Riding exposure at Interview-2 and at Interview-3 respectively relative to riding exposure at Interview-1
- Scale scores at Interview-2 and at Interview-3 respectively relative to scores at Interview-1 on the following self-reported attitudes:

  - Optimism bias on the likelihood of being involved in a crash in the next 12 months compared to other riders their age, gender and level of riding experience
  - Unrealistic confidence in own riding skills compared to other riders their age, gender and level of riding experience
    - Crash attributions to drivers
    - Crash attributions to motorcycle riders
    - Safety beliefs in riding
    - Deviant beliefs in riding

- Scale scores at Interview-2 and at Interview-3 respectively relative to scores at Interview-1 on the following self-reported motivations as measured by the MRMQ:
  - Convenience
  - Pleasure
  - Speed
- Scale scores at Interview-2 and at Interview-3 respectively relative to scores at Interview-1 on the following self-reported behaviours as measured by the MRBQ:
  - Errors
  - Speeding violations
  - Stunts performance
  - Protective gear use

Secondary outcome analyses for binary outcomes were conducted similarly to the binary primary outcomes described above. Count outcomes of "self-reported crashes" and "police-recorded offences" (overall, car and bike offences) were modelled with a zero-inflated Poisson regression. A zero-inflated Poisson regression was used because self-reported crashes and police-recorded offences had a non-normal Poisson distribution with the majority of participants having zero counts of crashes/offences. Count outcomes of "self-reported near misses/close calls" were modelled with a generalized Poisson regression because self-reported near misses/close calls had a non-normal Poisson distribution without the excess zeroes. All other continuous variables were modelled with a simple linear regression. All models were adjusted for age, gender, and riding exposure (riding hours in an average week) reported at baseline as well as time to follow-up (i.e. days between baseline and Interview-2, and days between baseline and Interview-3 respectively). All simple linear regression models also controlled for baseline scores so that the follow-up scores (outcome measures) were compared between the groups accounting for where they started from.

Time to first police-recorded is defined as first police-recorded crash from program completion for those who completed the program and from baseline interview date plus the average days to program completion (47 days). This outcome was treated by means of the Kaplan-Meier survival curves and tested using the log-rank test or the Cox model (when adjusted). The Cox model was adjusted with the time from baseline interview date to the date VicRide was completed for riders in the VicRide group because time to intervention may also affect the time to first crash in the VicRide group (e.g. riders who completed the program sooner may take longer/sooner to first crash than riders who completed the program later in the trial period). For riders in the control group, this time was set to "zero" given they did not complete the program.

2.2.2.3 Sensitivity analyses

Although intention-to-treat analysis is the critical analysis that delivers the methodological value of an RCT, given a number of riders who were assigned to the VicRide group did not actually complete VicRide it is possible that the program effects were diluted. A supplementary sensitivity analysis can assess the robustness of the results from an intention-to-treat analysis and was therefore performed to estimate the average effect of VicRide for only the VicRide riders who actually completed the program.

Of the participants randomised to the VicRide group (N=1232), 720 riders were flagged as having completed the program. A logistic regression was carried out among all participants randomised to the VicRide intervention to predict program completion. This logistic regression included all baseline characteristics with sufficient data, comprising of 45 variables. An automatic forward-selection procedure was used to build the model using an entry criterion of 0.5 (i.e. a variable with a p-value smaller than 50% was entered in the model). The final model included 28 variables that met the criterion. Due to missing values, 1,136 (92%) of 1,232 riders in the VicRide group contributed to the final model. Of the final 1,136 riders, 675 were flagged as completers, and 461 as non-completers.

The final model was applied to participants randomised to the control group in order to predict the probability of completion. The matching process consisted in pairing each VicRide completer to a participant allocated to the Control group who had the same probability of being a completer (propensity score).

Out of the 675 completers with a propensity score, 671 (99%) were matched to an appropriate control. To check the quality of the matching the distribution of all baseline characteristics as well as the standardised differences between the two groups were compared. All baseline characteristics were very well matched and had little standardised differences, indicating a good match.

All sensitivity analyses were therefore conducted in a subset of 1,342 participants consisting of 671 VicRide completers and 671 matched controls. That is, the effectiveness of VicRide was estimated by directly comparing the primary outcome and the secondary outcomes between this sub-sample of VicRide completers and matched control riders.

2.2.3 Process evaluation

Process evaluation data consisted of categorical and continuous variables as well as free responses. Categorical variables were summarised by frequencies and percentages. Percentages were calculated

according to the number of participants for whom data were available. Continuous variables were summarised by use of standard measures of central tendency and dispersion using mean and standard deviation as well as minimum and maximum values, and quartiles at 0.25, 0.5 and 0.75 where appropriate.

Human coding of the free responses was conducted rather than computer coding because many responses were expressed in a convoluted manner. Response category names were developed based on the common themes identified in the free responses. The purpose of the category names was to reflect the meaningful themes of the individual responses that were often expressed in a convoluted manner or in different ways that essentially had the same theme. The category names were developed and refined following multiple steps of coding and theory-driven and data-driven coding rules. The detailed methodology for the coding of the responses is included in Appendix 7.

2.2.4 Economic evaluation

For the same reasons explained above for the outcome evaluation, all analyses with respect to willingness to pay and cost-benefit evaluation were conducted on an intention-to-treat basis.

2.2.4.1 Willingness to pay for VicRide

The willingness to pay (WTP) amount was summarised by frequencies and percentages as well as by use of standard measures of central tendency and dispersion using mean and standard deviation, minimum and maximum values and quartiles. The certainty level with the WTP choice was also summarised by use of standard measures of central tendency and dispersion. The main reason for the WTP choice was summarised by frequencies and percentages.

WTP amount was then modelled with a simple linear regression adjusting for age, gender, and riding exposure (riding hours in an average week) reported at baseline as well as time to follow-up (i.e. days between baseline and Interview-2) to examine any differences in the values placed by the two study groups.

There were nine pre-set response categories for the main reason for the participants' WTP choice. When the pre-set categories did not apply, 'other' was recorded. When the interviewer entered the response as 'other', the interviewer recorded the reason in free text. These free texts were coded using the same coding methodology outlined in Appendix 7.

3. Results

3.1 Participant characteristics at baseline

A total of 2399 study participants completed the baseline interview between June 2010 and December 2012. Gender and age information were collected at the time of participants enrolling for the study. The majority (80.7%) were males and the average age was 35.3 years (SD=11.18). A total of 1232 participants were randomised into the VicRide group and 1167 participants into the control group. The participant characteristics identified by multiple variables were not statistically significantly different between the two groups, indicating the success of the randomisation and thus achieving methodological control of

potential confounding factors. Participant characteristics at baseline for the total participants and by study group are summarised in the Table in Appendix 2.2.

3.2 Participant characteristics at Interview-2

A total of 2128 study participants completed Interview-2 between September 2010 and April 2013. That is, 88.7% of the study participants were successfully followed up at Interview-2. This follow-up rate is extremely high. Participant characteristics at Interview-2 for the total participants and by study group are summarised in the Table in Appendix 3.2.

3.3 Participant characteristics at Interview-3

A total of 2102 study participants completed the baseline interview between June 2011 and January 2014. That is, 87.6% of the study participants were successfully followed up at Interview-3. This follow-up rate is extremely high. Participant characteristics at Interview-3 for the total participants and by study group are summarised in the Table in Appendix 4.2.

The majority (n=1898; 90.3%) of those who were followed up at Interview-3 were still riding. The three most common reasons for stopping riding were that they had no bike to ride (39.7%), they had a crash (20.1%), or they had health issues (10.3%). Of the 204 participants who were not riding at the time of Interview-3, 12.9% had no intention to return to riding. Current riding status and intention to return riding were not statistically significantly different between the VicRide and control groups. Therefore, 9.7% of respondents who were no longer riding at the time of Interview-3 did not respond to many questions that only applied if they were riding.

3.4 Outcome evaluation

3.4.1 Primary outcome evaluation

In order to maximise the statistical power, composite outcomes of at least one police-recorded or self-reported crash at 3-month and 12-month follow-up respectively were used to evaluate the effectiveness of VicRide. Given these primary outcomes were binary, logistic regression was analysed to produce odds ratios[5]. The effects of the program on these primary outcomes without (unadjusted estimates) and with adjustments for age, gender, and riding hours per week (adjusted estimates) are shown in Tables 2 and 3 for the 3-month and 12-month time points respectively. The composite crash rates were 6.4% in the control group and 5.8% in the VicRide group at 3-month follow-up, and 11.7% in the control group and 11.5% in the VicRide group at 12-month follow-up.

The odds of crashes (police-recorded or self-reported) did not differ statistically significantly at the 3-month (unadjusted odds ratio=0.904; p=0.5522; adjusted odds ratio=0.904; p=0.5591) or 12-month

[5] An odds ratio of 1 is interpreted as no difference. Odds ratios below 1 (e.g. 0.95) with a significant p-value (i.e. p<0.05) indicates VicRide shows less on the outcome than control by a percentage indicated by subtracting the odds ratio from 1 (e.g. 1-0.95x100=5% less). Odds ratios above 1 (e.g. 1.05) with a significant p-value (i.e. p<0.05) indicates VicRide shows more on the outcome than control by a percentage indicated by subtracting 1 from the odds ratio (e.g. 1.05-1x100=5% more). Odds ratios of any value with a non-significant p-value (i.e. p>0.05) mean it is no different from an odds ratio of 1 i.e. no effect.

follow-up (unadjusted odds ratio=0.988; p=0.9221; adjusted odds ratio=1.000; p=0.9997). That is, there was no effect of VicRide on likelihood of crash.

Table 2: Logistic regression of Self/Police reported crash at 3-month follow-up

	Univariate estimates		Adjusted estimates	
Variables	**OR (95% CI)**	**P-value**	**OR (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.904 (0.647, 1.262)	0.5522	0.904 (0.646, 1.267)	0.5591
Age	0.984 (0.968, 0.999)	0.0386	0.986 (0.971, 1.002)	0.0793
Gender (Male vs. Female)	0.969 (0.637, 1.473)	0.8815	0.886 (0.574, 1.365)	0.5824
Riding exposure (hours/week)	1.067 (1.033, 1.102)	<.0001	1.064 (1.029, 1.100)	0.0002

Table 3: Logistic regression of Self/Police reported crash at 12-month follow-up

	Univariate estimates		Adjusted estimates	
Variables	**OR (95% CI)**	**P-value**	**OR (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.988 (0.769, 1.268)	0.9221	1.000 (0.775, 1.290)	0.9997
Age	0.983 (0.972, 0.995)	0.0044	0.986 (0.975, 0.998)	0.0209
Gender (Male vs. Female)	1.305 (0.930, 1.833)	0.1238	1.187 (0.835, 1.688)	0.3386
Riding exposure (hours/week)	1.083 (1.052, 1.115)	<.0001	1.079 (1.048, 1.112)	<.0001

3.4.2 Secondary outcome evaluation

3.4.2.1 Police-recorded crashes

VicRide was also assessed in terms of police-recorded crashes only—at least one at the 3-month and 12-month follow-up respectively. The effects of the program on police-recorded crashes without (unadjusted estimates) and with adjustments for age, gender, and riding hours per week (adjusted estimates) are shown in Tables 4 and 5 for the 3-month and 12-month time points respectively.

Table 4: Logistic regression of Police reported crash at 3-month follow-up

	Univariate estimates		Adjusted estimates	
Variables	**OR (95% CI)**	**P-value**	**OR (95% CI)**	**P-value**
Program (VicRide vs. Control)	1.356 (0.514, 3.574)	0.5379	1.372 (0.519, 3.623)	0.5236
Age	1.000 (0.958, 1.044)	0.9937	1.002 (0.960, 1.046)	0.9157
Gender (Male vs. Female)	1.114 (0.319, 3.892)	0.8658	1.063 (0.300, 3.765)	0.9248
Riding exposure (hours/week)	1.041 (0.957, 1.132)	0.3465	1.042 (0.956, 1.136)	0.3457

Table 5: Logistic regression of Police reported crash at 12-month follow-up

	Univariate estimates		Adjusted estimates	
Variables	**OR (95% CI)**	**P-value**	**OR (95% CI)**	**P-value**
Program (VicRide vs. Control)	1.080 (0.652, 1.790)	0.7653	1.073 (0.643, 1.791)	0.7865

Variables	Univariate estimates		Adjusted estimates	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Age	0.992 (0.969, 1.015)	0.5070	0.995 (0.972, 1.018)	0.6635
Gender (Male vs. Female)	0.896 (0.482, 1.666)	0.7295	0.878 (0.458, 1.681)	0.6944
Riding exposure (hours/week)	1.063 (1.021, 1.106)	0.0031	1.064 (1.021, 1.108)	0.0032

The odds of police-recorded crashes were not statistically significantly different at 3-month (unadjusted odds ratio=1.356; p=0.5379; adjusted odds ratio=1.372; p=0.5236) or 12-month (unadjusted odds ratio=1.080; p=0.7653; adjusted odds ratio=1.073; p=0.7865); that is, there was no effect of VicRide on police-recorded crashes.

3.4.2.2 Time to first police recorded crash since baseline interview completion

Number of days to first police-recorded crash date from baseline interview date were compared between VicRide and control groups. Survival analyses produce hazard ratios that are interpreted similarly to odds ratios (refer to footnote 4 for details). The effects of the program on time to first crash without (unadjusted estimates) and with adjustments for age, gender, and riding hours per week (adjusted estimates) are shown in Tables 6.

The hazard ratios did not differ statistically significantly (unadjusted hazard ratio=1.066; p=0.8029; adjusted hazard ratio=0.950; p=0.8650) between the two groups. These results suggest VicRide did not have an effect on number of days to first crash.

Table 6: Cox model regression of Time to first crash

Variable	Un-adjusted			Adjusted		
	Hazard ratio	95% CI	P-value	Hazard ratio	95% CI	P-value
Program (VicRide vs Control)	1.066	(0.647 1.755)	0.8029	0.950	(0.529 1.709)	0.8650
Time to program completion from baseline interview				1.004	(0.995 1.013)	0.4372
Age				0.994	(0.971 1.017)	0.5821
Gender (Female vs Male)				1.114	(0.587 2.113)	0.7413
Riding exposure (hours/week)				1.057	(1.022 1.093)	0.0011

3.4.2.3 Police-recorded offences

Numbers of police-recorded offences in the 12-month follow-up period were compared between VicRide and control groups. In order to account for the non-normal distribution of number of offences, Poisson regression analyses were conducted to produce relative ratios. Relative ratios are interpreted similarly to odds ratios (see footnote 4 for details). The effects of the program on police-recorded offences with

unadjusted and adjusted estimates for age, gender, and riding hours per week are shown in Table 7. These analyses were also conducted on offences whilst in car and on a motorcycle respectively (Tables 8 and 9).

The relative ratios did not differ statistically significantly between the two groups with respect to overall offences (unadjusted relative ratio=0.928; p=0.3161; adjusted relative ratio=0.907; p=0.2077), car offences (unadjusted relative ratio=0.880; p=0.1446; adjusted relative ratio=0.873; p=0.1275), or bike offences (unadjusted relative ratio=1.088; p=0.5908; adjusted relative ratio=1.153; p=0.3277). These results suggest that VicRide had no effect on police-recorded offences.

Table 7: Total number of police reported offences at 12-month follow-up

	Univariate estimates		Adjusted estimates	
Variables	**RR (95% CI)**	**P-value**	**RR (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.928 (0.801, 1.074)	0.3161	0.907 (0.779, 1.056)	0.2077
Age	1.000 (0.993, 1.006)	0.9260	1.004 (0.998, 1.011)	0.2143
Gender (Male vs. Female)	1.252 (1.027, 1.527)	0.0263	1.186 (0.967, 1.455)	0.1015
Riding exposure (hours/week)	1.027 (1.012, 1.043)	0.0006	1.025 (1.008, 1.043)	0.0036

Table 8: Total number of police reported car offences at 12-month follow-up

	Univariate estimates		Adjusted estimates	
Variables	**RR (95% CI)**	**P-value**	**RR (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.880 (0.741, 1.045)	0.1446	0.873 (0.734, 1.039)	0.1275
Age	1.010 (1.003, 1.018)	0.0088	1.009 (1.002, 1.017)	0.0160
Gender (Male vs. Female)	0.976 (0.787, 1.211)	0.8271	1.040 (0.834, 1.296)	0.7264
Riding exposure (hours/week)	0.972 (0.945, 1.000)	0.0470	0.973 (0.946, 1.002)	0.0651

Table 9: Total number of police reported bike offences at 12-month follow-up

	Univariate estimates		Adjusted estimates	
Variables	**RR (95% CI)**	**P-value**	**RR (95% CI)**	**P-value**
Program (VicRide vs. Control)	1.088 (0.800, 1.480)	0.5908	1.153 (0.867, 1.534)	0.3277
Age	0.967 (0.953, 0.981)	<.0001	0.976 (0.963, 0.989)	0.0004
Gender (Male vs. Female)	3.833 (2.034, 7.226)	<.0001	3.166 (1.740, 5.759)	0.0002
Riding exposure (hours/week)	1.073 (1.058, 1.088)	<.0001	1.065 (1.049, 1.080)	<.0001

3.4.2.4 Self-reported outcomes

Multiple self-reported outcomes collected at Interview-2 and Interview-3 respectively were compared between the two study groups—VicRide and control groups. The effects of the program on the self-reported outcomes without (unadjusted estimates) and with adjustments for age, gender, riding hours per week, and baseline scores (adjusted estimates) are shown in Tables 10-44.

In order to account for the non-normal distribution of the number of self-reported crashes with excess number of zeros, zero-inflated Poisson regression analyses were conducted to produce relative ratios. These relative ratios are interpreted similarly to odds ratios (see footnote 4 for details).

The number of self-reported crashes did not differ statistically significantly at Interview-2 (unadjusted relative ratio=1.090; p=0.6728; adjusted relative ratio=1.102; p=0.6212) or Interview-3 (unadjusted relative ratio=1.031; p=0.8073; adjusted relative ratio=1.067; p=0.5958). These results suggest VicRide had no effect on self-reported crashes.

Table 10: Zero-Inflated Poisson regression of Crash frequency at Interview-2

	Univariate estimates		**Adjusted estimates**	
Variables	**RR (95% CI)**	**P-value**	**RR (95% CI)**	**adjusted P-value**
Program (VicRide vs. Control)	1.090 (0.730, 1.629)	0.6728	1.102 (0.750, 1.620)	0.6212
Age	0.972 (0.954, 0.990)	0.0023	0.974 (0.956, 0.993)	0.0067
Gender (Male vs. Female)	1.078 (0.642, 1.809)	0.7773	0.972 (0.587, 1.609)	0.9108
Riding exposure (hours/week)	1.052 (1.019, 1.085)	0.0019	1.046 (1.015, 1.078)	0.0035

Table 11: Zero-Inflated Poisson regression of Crash frequency at Interview-3

	Univariate estimates		**Adjusted estimates**	
Variables	**RR (95% CI)**	**P-value**	**RR (95% CI)**	**adjusted P-value**
Program (VicRide vs. Control)	1.031 (0.805, 1.322)	0.8073	1.067 (0.839, 1.359)	0.5958
Age	0.978 (0.967, 0.990)	0.0002	0.982 (0.971, 0.993)	0.0019
Gender (Male vs. Female)	1.487 (1.043, 2.121)	0.0285	1.319 (0.928, 1.876)	0.1227
Riding exposure (hours/week)	1.057 (1.041, 1.074)	<.0001	1.052 (1.036, 1.069)	<.0001

In order to account for the non-normal distribution of the number of self-reported near misses/close calls, Poisson regression analyses were conducted to produce relative ratios. These relative ratios are interpreted similarly to odds ratios (see footnote 4 for details).

A program effect was evident for self-reported near misses/close calls at Interview-2 only, even after accounting for age, gender, and riding exposure (adjusted relative ratio=0.905; p=0.0182). The significant program effects are highlighted in bold italics in Table 12. The adjusted relative ratio indicates that the VicRide group reported 9.5% fewer near misses/close calls than the control group even after accounting for the amount of riding, age and gender. However this effect was not sustained at 12 months (Table 13).

Table 12: Poisson regression of Frequency of near misses/close calls at Interview-2

	Univariate estimates	**Adjusted estimates**

Variables	RR (95% CI)	P-value	RR (95% CI)	adjusted P-value
Program (VicRide vs. Control)	***0.884 (0.815, 0.959)***	***0.0030***	***0.905 (0.833, 0.983)***	***0.0182***
Age	0.975 (0.971, 0.979)	<.0001	0.979 (0.975, 0.983)	<.0001
Gender (Male vs. Female)	1.550 (1.377, 1.745)	<.0001	1.375 (1.218, 1.552)	<.0001
Riding exposure (hours/week)	1.060 (1.054, 1.066)	<.0001	1.053 (1.047, 1.059)	<.0001

Table 13: Poisson regression of count of near misses/close calls at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	RR (95% CI)	P-value	RR (95% CI)	adjusted P-value
Program (VicRide vs. Control)	1.000 (0.918, 1.090)	0.9940	1.013 (0.929, 1.105)	0.7713
Age	0.973 (0.969, 0.977)	<.0001	0.978 (0.973, 0.982)	<.0001
Gender (Male vs. Female)	1.921 (1.675, 2.204)	<.0001	1.683 (1.464, 1.935)	<.0001
Riding exposure (hours/week)	1.053 (1.047, 1.059)	<.0001	1.045 (1.038, 1.052)	<.0001

Table 14: Logistic regression of Composite outcome of self-reported crashes or near misses/close calls at Interview-2

	Univariate estimates		Adjusted estimates	
Variables	OR (95% CI)	P-value	OR (95% CI)	P-value
Program (VicRide vs. Control)	0.932 (0.786, 1.105)	0.4154	0.951 (0.798, 1.134)	0.5774
Age	0.982 (0.975, 0.990)	<.0001	0.986 (0.978, 0.994)	0.0004
Gender (Male vs. Female)	1.597 (1.279, 1.994)	<.0001	1.421 (1.130, 1.788)	0.0026
Riding exposure (hours/week)	1.126 (1.094, 1.160)	<.0001	1.115 (1.083, 1.149)	<.0001

Table 15: Logistic regression of Composite outcome of self-reported crashes or near misses/close calls at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	OR (95% CI)	P-value	OR (95% CI)	P-value
Program (VicRide vs. Control)	1.118 (0.940, 1.331)	0.2083	1.134 (0.946, 1.358)	0.1739
Age	0.974 (0.967, 0.982)	<.0001	0.978 (0.970, 0.986)	<.0001
Gender (Male vs. Female)	1.809 (1.438, 2.275)	<.0001	1.588 (1.254, 2.013)	0.0001
Riding exposure (hours/week)	1.126 (1.092, 1.160)	<.0001	1.112 (1.079, 1.147)	<.0001

The program was also assessed on composite outcomes of at least one self-reported crash or near miss/close call or not at Interview-2 and Interview-3. These composite outcomes were binary and logistic regression was conducted to produce odds ratios[4]. Neither of the composite outcomes was statistically significant.

When the program was assessed in terms of effect on injury crashes (i.e. binary outcomes of any injury and rider injury involved in the most serious crash self-reported at Interview-3 respectively), again no statistically significant effects were found.

Table 16.1: Logistic regression of Injury involved in the most serious crash at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	**OR (95% CI)**	**P-value**	**OR (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.761 (0.530, 1.094)	0.1405	0.782 (0.542, 1.127)	0.1869
Age	0.985 (0.968, 1.001)	0.0688	0.989 (0.973, 1.006)	0.1968
Gender (Male vs. Female)	1.818 (1.048, 3.153)	0.0334	1.627 (0.932, 2.841)	0.0866
Riding exposure (hours/week)	1.059 (1.023, 1.097)	0.0011	1.053 (1.016, 1.091)	0.0042

Table 16.2: Logistic regression of Rider injured in the most serious crash at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	**OR (95% CI)**	**P-value**	**OR (95% CI)**	**P-value**
Program (VicRide vs. Control)	1.276 (0.893, 1.822)	0.1810	1.317 (0.915, 1.894)	0.1379
Age	0.977 (0.961, 0.994)	0.0070	0.979 (0.963, 0.996)	0.0146
Gender (Male vs. Female)	1.067 (0.676, 1.685)	0.7814	0.927 (0.577, 1.489)	0.7532
Riding exposure (hours/week)	1.078 (1.041, 1.116)	<.0001	1.075 (1.038, 1.115)	<.0001

Given riding exposure is a continuous linear variable, simple linear regression was conducted to produce beta coefficients[6].

Table 17: Linear regression of Riding exposure (hours/week) at Interview-2

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.174 (-.162, 0.510)	0.3093	0.274 (-.033, 0.581)	0.0801
Age	-.014 (-.030, 0.001)	0.0610	0.002 (-.012, 0.016)	0.7880
Gender (Male vs. Female)	1.039 (0.613, 1.465)	<.0001	0.597 (0.201, 0.993)	0.0031
Riding exposure (hours/week) at Interview-1	0.455 (0.413, 0.496)	<.0001	0.450 (0.408, 0.492)	<.0001

Table 18 Linear regression of Riding exposure (hours/week) at Interview-3

	Univariate estimates	Adjusted estimates

[6] Positive coefficients with significant p-values ($p<0.05$) indicate a positive linear relationship. That is, the VicRide group shows higher value on the outcome assessed (e.g. exposure). Negative coefficients with significant p-values ($p<0.05$) indicate a negative linear relationship. That is, the VicRide group shows lower value on the outcome assessed (e.g. exposure). Any coefficients, whether positive or negative, with non-significant p-values ($p>0.05$) indicate no relationship.

Variables	coefficient (95% CI)	P-value	coefficient (95% CI)	P-value
Program (VicRide vs. Control)	0.251 (-.079, 0.581)	0.1358	***0.319 (0.017, 0.622)***	***0.0385***
Age	-.007 (-.022, 0.007)	0.3216	0.007 (-.006, 0.021)	0.2793
Gender (Male vs. Female)	0.820 (0.396, 1.243)	0.0001	0.431 (0.037, 0.824)	0.0319
Riding exposure (hours/week) at Interview-1	0.410 (0.370, 0.451)	<.0001	0.410 (0.369, 0.451)	<.0001

The differences in riding exposure between the two groups were only statistically significant at Interview-3. After adjusting for age, gender, and riding exposure at baseline, riding exposure at Interview-3 was statistically significantly greater for the VicRide group than the control group at Interview-3 only (adjusted beta coefficient=0.319; p=0.0385). The statistically significant program effects are highlighted in bold italics in Table 18. That is, after about 12 months after program participation, the VicRide group were riding more in an average week than the control group.

All other secondary outcomes of self-reported attitudes, behaviours and motivations were continuous linear variables. Therefore simple linear regression was conducted to produce beta coefficients.

Table 19: Linear regression of optimism bias for crash risks at Interview-2

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	-.052 (-.121, 0.017)	0.1368	-.051 (-.118, 0.015)	0.1291
Age	-.009 (-.012, -.006)	<.0001	-.008 (-.011, -.005)	<.0001
Gender (Male vs. Female)	-.121 (-.209, -.034)	0.0064	-.116 (-.202, -.030)	0.0081
Riding exposure (hours/week)	0.001 (-.008, 0.011)	0.7675	-.000 (-.010, 0.009)	0.9238
Optimism bias crash score at Interview 1	0.189 (0.159, 0.220)	<.0001	0.179 (0.148, 0.210)	<.0001

Table 20: Linear regression of optimism bias for crash risks at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	-.018 (-.087, 0.051)	0.6079	-.031 (-.098, 0.036)	0.3684
Age	-.007 (-.010, -.004)	<.0001	-.006 (-.009, -.003)	0.0002
Gender (Male vs. Female)	-.105 (-.192, -.017)	0.0187	-.105 (-.191, -.019)	0.0166
Riding exposure (hours/week)	-.006 (-.016, 0.003)	0.1886	-.009 (-.018, 0.000)	0.0613
Optimism bias crash score at Interview 1	0.188 (0.156, 0.220)	<.0001	0.181 (0.148, 0.213)	<.0001

No statistically significant differences were evident for any of the self-reported attitudes except unrealistic confidence in riding skills and crash attribution to riders. Although the VicRide participants continued to have optimism bias for crash risks (means were 2.5 at the two follow-ups), their level of optimism bias

was no more or less than the control group as indicated by the non- statistically significant results for the optimism bias for crash risks[7].

The scores on unrealistic confidence in riding skills[8] were statistically significantly lower for the VicRide group at both Interview-2 (adjusted beta coefficient=-0.073; p=0.0013) and Interview-3 (adjusted beta coefficient=-0.070; p=0.0020) than the control group, even after age, gender, and riding exposure were accounted for. The statistically significant program effects are highlighted in bold italics in Tables 21 and 22. That is, the VicRide group showed significantly more unrealistic confidence in riding skills than the control group at both Interview-2 and Interview-3; that is, they were more confident in their riding skills.

Table 21: Linear regression of unrealistic confidence in riding skills score at Interview-2

	Univariate estimates		**Adjusted estimates**	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	***-.055 (-.104, -.005)***	***0.0300***	***-.073 (-.117, -.028)***	***0.0013***
Age	0.001 (-.001, 0.003)	0.5143	-.002 (-.004, 0.000)	0.1139
Gender (Male vs. Female)	-.159 (-.222, -.097)	<.0001	-.055 (-.114, 0.003)	0.0613
Riding exposure (hours/week)	-.019 (-.026, -.013)	<.0001	-.010 (-.016, -.004)	0.0012
Unrealistic confidence in riding skills score at Interview 1	0.477 (0.438, 0.515)	<.0001	0.461 (0.422, 0.500)	<.0001

Table 22: Linear regression of unrealistic confidence in riding skills score at Interview-3

	Univariate estimates		**Adjusted estimates**	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	***-.065 (-.114, -.015)***	***0.0105***	***-.070 (-.114, -.026)***	***0.0020***
Age	0.000 (-.002, 0.002)	0.8736	-.001 (-.003, 0.001)	0.1563
Gender (Male vs. Female)	-.144 (-.207, -.081)	<.0001	-.050 (-.108, 0.008)	0.0929
Riding exposure (hours/week)	-.022 (-.028, -.015)	<.0001	-.013 (-.019, -.007)	<.0001
Unrealistic confidence in riding skills score at Interview 1	0.455 (0.416, 0.493)	<.0001	0.440 (0.401, 0.479)	<.0001

Table 23: Linear regression of crash attribution scale[9] - driver attribution score at Interview-2

[7] Question: "Thinking just about riders your age and gender, and with the same level of riding experience, how much more likely or unlikely do you think it is that YOU will be involved in a motorcycle crash in the next 12 months? Much less likely (1), Less likely (2), Just as likely (3), More likely (4) and Much more likely (5)". That is, any score below 3 is considered optimism bias and the mean overall was 2.5.

[8] Question: "Compared to other riders your age, gender and level of riding experience, how much better or worse do you think you are at each of the following? Much better (1), Better (2), About the same (3), Worse (4) or Much worse (5)". That is, any score below 3 is considered unrealistic confidence and the mean in the VicRide group was lower at 2.4 than the control group at 2.5 at the two follow-ups.

[9] The response scales for all the crash attributions scales were Strongly agree (1), Agree (2), Neither agree or Disagree (3), then Disagree (4) and Strongly disagree (5). That is, the lower the score the driver/rider attribution scale, the more attribution of causes of crashes to drivers/riders.

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	-.020 (-.060, 0.021)	0.3407	-.013 (-.049, 0.023)	0.4730
Age	-.004 (-.006, -.003)	<.0001	-.002 (-.003, -.000)	0.0271
Gender (Male vs. Female)	0.074 (0.023, 0.125)	0.0047	0.024 (-.022, 0.070)	0.2974
Riding exposure (hours/week)	-.006 (-.011, -.000)	0.0440	-.004 (-.008, 0.001)	0.1537
driver attribution scale score at Interview 1	0.475 (0.438, 0.511)	<.0001	0.465 (0.427, 0.502)	<.0001

Table 24: Linear regression of crash attribution scale - driver attribution score at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	-.006 (-.046, 0.034)	0.7747	0.001 (-.035, 0.036)	0.9766
Age	-.006 (-.008, -.004)	<.0001	-.004 (-.005, -.002)	<.0001
Gender (Male vs. Female)	0.060 (0.010, 0.111)	0.0187	0.003 (-.043, 0.049)	0.8980
Riding exposure (hours/week)	-.005 (-.011, 0.000)	0.0551	-.004 (-.009, 0.001)	0.1555
driver attribution scale score at Interview 1	0.418 (0.381, 0.455)	<.0001	0.404 (0.366, 0.441)	<.0001

The scores on the rider attribution scale were statistically significantly lower for the VicRide group at both Interview-2 (adjusted beta coefficient=-0.057; p=0.0139) and Interview-3 (adjusted beta coefficient=-0.049; p=0.0450) than the control group, even after age, gender, and riding exposure were accounted for. That is, the VicRide group attributed the cause of crashes to riders (as opposed to drivers) significantly more than the control at both Interview-2 and Interview-3. The statistically significant program effects are highlighted in bold italics in Tables 25 and 26.

Table 25: Linear regression of crash attribution scale - rider attribution score at Interview-2

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	***-.086 (-.138, -.034)***	***0.0013***	***-.057 (-.103, -.012)***	***0.0139***
Age	-.007 (-.009, -.005)	<.0001	-.003 (-.005, -.001)	0.0080
Gender (Male vs. Female)	-.002 (-.070, 0.065)	0.9430	-.014 (-.073, 0.045)	0.6481
Riding exposure (hours/week)	0.009 (0.002, 0.016)	0.0171	0.002 (-.004, 0.009)	0.4634
rider attribution scale score at Interview 1	0.519 (0.482, 0.556)	<.0001	0.509 (0.471, 0.547)	<.0001

Table 26: Linear regression of crash attribution scale - rider attribution score at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	***-.072 (-.126, -.018)***	***0.0093***	***-.049 (-.097, -.001)***	***0.0450***

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Age	-.005 (-.007, -.003)	<.0001	-.001 (-.003, 0.001)	0.4706
Gender (Male vs. Female)	0.004 (-.065, 0.073)	0.9073	0.004 (-.057, 0.066)	0.8906
Riding exposure (hours/week)	0.008 (0.001, 0.016)	0.0268	0.004 (-.003, 0.010)	0.2733
rider attribution scale score at Interview 1	0.495 (0.456, 0.534)	<.0001	0.490 (0.450, 0.529)	<.0001

However, the very low reliability of this scale (Cronbach's alpha ranging from .35 to .43 for the three survey time-points) must be noted, and caution must be made in interpreting this statistically significant result.

No statistically significant differences were evident for any of the safety beliefs scales[10].

Table 27: Linear regression of safety beliefs scale - safety beliefs score at Interview-2

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.032 (-.025, 0.089)	0.2662	0.039 (-.009, 0.086)	0.1103
Age	-.013 (-.015, -.010)	<.0001	-.006 (-.008, -.004)	<.0001
Gender (Male vs. Female)	0.149 (0.077, 0.221)	<.0001	0.084 (0.023, 0.145)	0.0071
Riding exposure (hours/week)	0.013 (0.005, 0.020)	0.0015	0.004 (-.002, 0.011)	0.1796
Safety beliefs score at Interview 1	0.566 (0.530, 0.603)	<.0001	0.542 (0.505, 0.578)	<.0001

Table 28: Linear regression of safety beliefs scale - safety beliefs score at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	-.019 (-.079, 0.041)	0.5308	0.000 (-.050, 0.051)	0.9907
Age	-.014 (-.016, -.011)	<.0001	-.007 (-.010, -.005)	<.0001
Gender (Male vs. Female)	0.152 (0.077, 0.228)	<.0001	0.079 (0.015, 0.143)	0.0157
Riding exposure (hours/week)	0.008 (-.000, 0.016)	0.0638	-.001 (-.008, 0.006)	0.8086
Safety beliefs score at Interview 1	0.563 (0.524, 0.602)	<.0001	0.534 (0.494, 0.573)	<.0001

Table 29: Linear regression of safety beliefs scale - deviant beliefs score at Interview-2

	Univariate estimates	Adjusted estimates

[10] The response scales for all the safety beliefs scales were Strongly agree (1), Agree (2), Neither agree or Disagree (3), then Disagree (4) and Strongly disagree (5). That is, the lower the score on safety/deviant beliefs scale, the stronger were the safety/deviant beliefs.

Variables	coefficient (95% CI)	P-value	coefficient (95% CI)	P-value
Program (VicRide vs. Control)	-.003 (-.060, 0.054)	0.9123	0.001 (-.038, 0.039)	0.9720
Age	0.018 (0.015, 0.020)	<.0001	0.005 (0.003, 0.007)	<.0001
Gender (Male vs. Female)	-.299 (-.371, -.228)	<.0001	-.113 (-.163, -.062)	<.0001
Riding exposure (hours/week)	-.012 (-.020, -.005)	0.0016	-.002 (-.007, 0.003)	0.4334
Safety belief score at Interview 1	-.092 (-.151, -.033)	0.0022	0.734 (0.702, 0.766)	<.0001

Table 30: Linear regression of safety beliefs scale - deviant beliefs at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	coefficient (95% CI)	P-value	coefficient (95% CI)	P-value
Program (VicRide vs. Control)	-.025 (-.082, 0.033)	0.4038	-.016 (-.056, 0.025)	0.4403
Age	0.017 (0.015, 0.020)	<.0001	0.006 (0.004, 0.008)	<.0001
Gender (Male vs. Female)	-.313 (-.384, -.241)	<.0001	-.115 (-.167, -.063)	<.0001
Riding exposure (hours/week)	-.015 (-.023, -.008)	0.0001	-.004 (-.010, 0.001)	0.1257
Safety belief score at Interview 1	-.114 (-.174, -.055)	0.0002	0.707 (0.673, 0.740)	<.0001

No statistically significant differences were evident for any of the self-reported motivations for riding as measured by the MRMQ[11].

Table 31: Linear regression of MRMQ scale - convenience score at Interview-2

	Univariate estimates		Adjusted estimates	
Variables	coefficient (95% CI)	P-value	coefficient (95% CI)	P-value
Program (VicRide vs. Control)	-.015 (-.077, 0.048)	0.6482	-.028 (-.074, 0.017)	0.2237
Age	0.018 (0.015, 0.021)	<.0001	0.006 (0.004, 0.008)	<.0001
Gender (Male vs. Female)	-.348 (-.427, -.270)	<.0001	-.091 (-.151, -.032)	0.0026
Riding exposure (hours/week)	-.038 (-.046, -.029)	<.0001	-.011 (-.017, -.005)	0.0007
Convenience score at Interview 1	0.669 (0.639, 0.700)	<.0001	0.628 (0.595, 0.660)	<.0001

Table 32: Linear regression of MRMQ scale score - convenience score at Interview-3

	Univariate estimates	Adjusted estimates

[11] The response scales for all the MRMQ scales were Strongly agree (1), Agree (2), Neither agree or Disagree (3), then Disagree (4) and Strongly disagree (5). That is, the lower the score, the more applicable was the riding motivation.

Variables	coefficient (95% CI)	P-value	coefficient (95% CI)	P-value
Program (VicRide vs. Control)	0.028 (-.036, 0.091)	0.3920	0.026 (-.022, 0.074)	0.2845
Age	0.016 (0.013, 0.018)	<.0001	0.005 (0.002, 0.007)	<.0001
Gender (Male vs. Female)	-.348 (-.427, -.269)	<.0001	-.094 (-.156, -.032)	0.0031
Riding exposure (hours/week)	-.036 (-.045, -.028)	<.0001	-.011 (-.018, -.004)	0.0011
Convenience score at Interview 1	0.633 (0.602, 0.665)	<.0001	0.599 (0.565, 0.633)	<.0001

Table 33: Linear regression of MRMQ score - pleasure score at Interview-2

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	-.016 (-.055, 0.023)	0.4269	-.026 (-.053, 0.001)	0.0585
Age	0.002 (0.001, 0.004)	0.0058	0.001 (-.000, 0.002)	0.1748
Gender (Male vs. Female)	0.060 (0.010, 0.109)	0.0176	0.028 (-.007, 0.063)	0.1112
Riding exposure (hours/week)	-.013 (-.018, -.008)	<.0001	-.003 (-.006, 0.001)	0.1837
Pleasure score at Interview 1	0.739 (0.709, 0.769)	<.0001	0.736 (0.706, 0.766)	<.0001

Table 34: Linear regression of MRMQ scale - pleasure score at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	-.021 (-.061, 0.019)	0.3104	-.029 (-.059, 0.001)	0.0604
Age	0.001 (-.001, 0.003)	0.2158	-.001 (-.002, 0.001)	0.4488
Gender (Male vs. Female)	0.002 (-.048, 0.053)	0.9307	-.031 (-.069, 0.008)	0.1202
Riding exposure (hours/week)	-.014 (-.019, -.008)	<.0001	-.003 (-.007, 0.001)	0.1470
Pleasure score at Interview 1	0.697 (0.663, 0.730)	<.0001	0.695 (0.661, 0.729)	<.0001

Table 35: Linear regression of MRMQ scale - speeding motivation score at Interview-2

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.003 (-.047, 0.054)	0.9010	0.006 (-.026, 0.039)	0.7005
Age	0.019 (0.017, 0.021)	<.0001	0.006 (0.004, 0.007)	<.0001
Gender (Male vs. Female)	-.310 (-.373, -.247)	<.0001	-.106 (-.149, -.064)	<.0001
Riding exposure (hours/week)	-.019 (-.026, -.012)	<.0001	-.005 (-.010, -.000)	0.0408
Speed motivation score at Interview 1	0.781 (0.753, 0.810)	<.0001	0.723 (0.693, 0.754)	<.0001

Table 36: Linear regression of MRMQ scale - speeding motivation score at Interview-3

	Univariate estimates	Adjusted estimates

Variables	coefficient (95% CI)	P-value	coefficient (95% CI)	P-value
Program (VicRide vs. Control)	-.022 (-.074, 0.030)	0.4115	-.017 (-.053, 0.019)	0.3542
Age	0.019 (0.016, 0.021)	<.0001	0.006 (0.005, 0.008)	<.0001
Gender (Male vs. Female)	-.320 (-.385, -.256)	<.0001	-.107 (-.154, -.061)	<.0001
Riding exposure (hours/week)	-.022 (-.029, -.015)	<.0001	-.009 (-.014, -.004)	0.0009
Speed motivation score at Interview 1	0.751 (0.719, 0.782)	<.0001	0.687 (0.654, 0.721)	<.0001

No statistically significant differences were evident for any of the self-reported riding behaviours as measured by the MRBQ[12] except speeding behaviour. The scores on the MRBQ scale of speeding behaviour were statistically significantly higher for the VicRide group at both Interview-2 (adjusted beta coefficient=0.054; p=0.0103) and Interview-3 (adjusted beta coefficient=0.056; p=0.0157) than the control group, when age, gender, and riding exposure were accounted for. The statistically significant program effects are highlighted in bold italics in Tables 39 and 40. That is, significantly more speeding behaviours were reported by the VicRide group than the control group at both Interview-2 and Interview-3.

Table 37: Linear regression of MRBQ scale - error score at Interview-2

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.011 (-.019, 0.041)	0.4797	0.019 (-.003, 0.042)	0.0959
Age	-.007 (-.008, -.006)	<.0001	-.003 (-.004, -.002)	<.0001
Gender (Male vs. Female)	0.058 (0.020, 0.096)	0.0030	0.028 (-.001, 0.058)	0.0598
Riding exposure (hours/week)	0.005 (0.001, 0.009)	0.0118	-.002 (-.005, 0.002)	0.3150
Error score at Interview 1	0.662 (0.630, 0.695)	<.0001	0.643 (0.609, 0.677)	<.0001

Table 38: Linear regression of MRBQ scale - error score at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.000 (-.031, 0.031)	0.9862	0.007 (-.018, 0.031)	0.5797
Age	-.007 (-.008, -.005)	<.0001	-.003 (-.004, -.002)	<.0001
Gender (Male vs. Female)	0.036 (-.003, 0.075)	0.0676	-.003 (-.034, 0.028)	0.8417
Riding exposure (hours/week)	0.006 (0.002, 0.011)	0.0025	-.001 (-.004, 0.003)	0.7010
Error score at Interview 1	0.630 (0.595, 0.666)	<.0001	0.614 (0.577, 0.650)	<.0001

Table 39: Linear regression of MRBQ scale - speeding behaviour score at Interview-2

[12] The response scales for all the MRBQ scales were in frequency of Never (1), Hardly ever (2), Occasionally (3), Quite often (4), Frequently (5), and All the time (6). That is, the higher the score, the more frequent the behaviour.

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.037 (-.022, 0.096)	0.2159	***0.054 (0.013, 0.096)***	***0.0103***
Age	-.019 (-.021, -.016)	<.0001	-.005 (-.007, -.003)	<.0001
Gender (Male vs. Female)	0.304 (0.230, 0.378)	<.0001	0.085 (0.031, 0.138)	0.0020
Riding exposure (hours/week)	0.024 (0.016, 0.032)	<.0001	0.001 (-.005, 0.007)	0.7336
Speed behaviour score at Interview 1	0.745 (0.714, 0.776)	<.0001	0.707 (0.674, 0.741)	<.0001

Table 40: Linear regression of MRBQ scale - speeding behaviour score at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.055 (-.008, 0.117)	0.0850	***0.056 (0.011, 0.101)***	***0.0157***
Age	-.019 (-.022, -.017)	<.0001	-.007 (-.009, -.004)	<.0001
Gender (Male vs. Female)	0.324 (0.247, 0.401)	<.0001	0.102 (0.044, 0.161)	0.0006
Riding exposure (hours/week)	0.026 (0.018, 0.035)	<.0001	0.002 (-.004, 0.009)	0.4587
Speed behaviour score at Interview 1	0.745 (0.711, 0.780)	<.0001	0.695 (0.659, 0.732)	<.0001

Table 41: Linear regression of MRBQ scale - stunts score at Interview-2

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	0.007 (-.024, 0.039)	0.6380	0.014 (-.012, 0.039)	0.2869
Age	-.008 (-.009, -.006)	<.0001	-.004 (-.005, -.003)	<.0001
Gender (Male vs. Female)	0.115 (0.076, 0.154)	<.0001	0.050 (0.017, 0.083)	0.0032
Riding exposure (hours/week)	0.009 (0.005, 0.013)	<.0001	0.003 (-.001, 0.006)	0.1425
Stunts score at Interview 1	0.582 (0.546, 0.617)	<.0001	0.543 (0.507, 0.580)	<.0001

Table 42: Linear regression of MRBQ scale score - stunts score at Interview-3

	Univariate estimates		Adjusted estimates	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	-.006 (-.042, 0.029)	0.7261	-.003 (-.032, 0.027)	0.8629
Age	-.008 (-.009, -.006)	<.0001	-.003 (-.005, -.002)	<.0001
Gender (Male vs. Female)	0.144 (0.099, 0.188)	<.0001	0.070 (0.032, 0.108)	0.0003
Riding exposure (hours/week)	0.013 (0.008, 0.018)	<.0001	0.006 (0.002, 0.010)	0.0028
Stunts score at Interview 1	0.657 (0.612, 0.702)	<.0001	0.617 (0.571, 0.663)	<.0001

Table 43: Linear regression of MRBQ scale - protective gear use score at Interview-2

Variables	Univariate estimates coefficient (95% CI)	P-value	Adjusted estimates coefficient (95% CI)	P-value
Program (VicRide vs. Control)	0.055 (-.031, 0.141)	0.2073	0.038 (-.028, 0.104)	0.2565
Age	0.013 (0.009, 0.016)	<.0001	0.005 (0.002, 0.008)	0.0015
Gender (Male vs. Female)	-.193 (-.302, -.085)	0.0005	-.058 (-.143, 0.027)	0.1814
Riding exposure (hours/week)	0.007 (-.005, 0.019)	0.2490	0.005 (-.004, 0.014)	0.2398
Protective gear use score at Interview 1	0.642 (0.609, 0.674)	<.0001	0.629 (0.596, 0.662)	<.0001

Table 44: Linear regression of MRBQ scale - protective gear use score at Interview-3

Variables	Univariate estimates coefficient (95% CI)	P-value	Adjusted estimates coefficient (95% CI)	P-value
Program (VicRide vs. Control)	0.004 (-.082, 0.090)	0.9341	-.001 (-.070, 0.068)	0.9767
Age	0.013 (0.009, 0.017)	<.0001	0.005 (0.002, 0.008)	0.0007
Gender (Male vs. Female)	-.275 (-.383, -.167)	<.0001	-.138 (-.227, -.050)	0.0022
Riding exposure (hours/week)	0.002 (-.010, 0.014)	0.7180	0.002 (-.007, 0.011)	0.6726
Protective gear use score at Interview 1	0.596 (0.562, 0.630)	<.0001	0.583 (0.548, 0.618)	<.0001

3.4.3 Sensitivity analyses

Given a number of riders who were assigned to the intervention group did not actually complete VicRide, sensitivity analyses were performed to assess the robustness of the results from intention-to-treat analyses. Sensitivity analyses directly compared the primary outcome and the secondary outcomes between the sub-sample of VicRide riders who actually completed the program and matched control riders. All sensitivity analyses were conducted in a subset of 1,342 participants consisting of 671 VicRide completers and 671 matched controls.

Primary outcome and most of the secondary outcome analyses on an intention-to-treat basis were repeated on the sub-sample. Tables of regression results are presented in Appendix 8. All the sensitivity analyses results were consistent with the main results based on intention-to-treat analyses except in relation to the following three aspects:

1. When focused on VicRide completers versus matched controls, the statistically significant program effects on near misses/close calls found in the intention-to-treat analysis at Interview-2 were no longer statistically significant. However, both the unadjusted and adjusted relative ratios were in the same direction as the significant result found in the intention-to-treat analyses (i.e. VicRide riders self-reported they had fewer near misses/close calls than the control riders).

2. When focused on VicRide completers versus matched controls, the VicRide group had statistically significantly greater riding exposure at Interview-2 than the control group as opposed to no statistically significant difference in the intention-to-treat analysis. However, the statistically

significant program effects on riding exposure found in the intention-to-treat analysis at Interview-3 were no longer statistically significant. Nevertheless, both the unadjusted and adjusted co-efficients were in the same direction for both Interview-2 and Interview-3 based on both intention-to-treat and sensitivity analyses (i.e. VicRide riders were riding more hours than the control riders).

3. When focused on VicRide completers versus matched control, the statistically significant program effects on attribution of the cause of crashes to riders (as opposed to drivers) only remained in the univariate model and were no longer significant in the multivariate model. Nevertheless, both the unadjusted and adjusted co-efficients were in the same direction for both Interview-2 and Interview-3 based on both intention-to-treat and sensitivity analyses (i.e. VicRide riders attributed the cause of crashes to riders more than the control riders).

4. When focused on VicRide completers versus matched controls, the non-significant results on self-reported protective gear use found in the intention-to-treat analyses became statistically significant in the multivariate model at Interview-2 only. Given all the other models were clearly non-significant in both intention-to-treat and sensitivity analyses, this singular significant result is likely to be due to chance.

3.5 Process evaluation

3.5.1 Coach feedback on the coach training and VicRide program

3.5.1.1 Coach characteristics

Of the 22 coaches who completed the coach training, 18 completed the survey after the coach training. Characteristics of theses coaches are summarised in Table 45. Only one of them was female. The trained coaches were aged between 32 and 57, the average being 45 years (SD=6.8). All coaches reported they had been riding for more than 10 years.

The coaches reported that the types of motorcycles they rode most frequently[13] were sports (n=9; 52.9%), standard (n=4; 23.5%), touring (n=3; 17.6%), cruisers (n=2; 11.8%), or adventure (n=1; 5.9%). None of the coaches reported that they rode a scooter or an off-road bike. Most coaches reported that they rode on public roads most days of the week—every day (n=7; 38.9%) or 4-6 days a week (n=6; 33.3%), and the rest 2-3 days a week (n=4; 22.2%). Coaches reported riding an average of 9 hours (SD=5.4) per week or 473km (SD=191.4) per week. Half the coaches rode more than 50km from home three or more times a week and approximately 30% (n=5) rode once or twice a week with none of them less than once a year. All coaches reported having ridden off-road but 16.7% (n=3) reported not riding off-road anymore. Approximately 40% (n=7) of the coaches reported currently riding off-road 1-5 times a year.

Over half the coaches (n=11; 61.1%) reported that they work as a motorcycle rider trainer full-time, the rest (n=7; 38.9%) part-time. On average the coaches had been a motorcycle rider trainer for 7.4 years (SD=5.6) and had worked as a motorcycle trainer for an overage of 144 days (SD=95.4) in the last 12 months. Other than being a motorcycle trainer, one coach also reported riding as part of employment.

[13] Two coaches rode two kinds of bikes most frequently.

Other than the present training, three coaches had never undertaken training courses for trainers/coaches before. The rest (n=14; 82.4%) had undertaken at last one training course in the last 5 years. Most of the training courses were oriented to motorcycle training provided by organisations such as HART, DECA, and Motorcycling Australia, but others were oriented to Training and Assessment, Competitive Manufacturing, Motor Vehicle Instructor, First Aid, Diploma of VET practice, Occupational Health and safety, online facilitator, Police instructor, and Australia Post.

Table 45: Coach Characteristics

Characteristics	**Coach survey (N = 18)**
Age (years)	
N	18
Mean (SD)	44.8 (6.84)
Median (Q1, Q3)	43.0 (41.0, 51.0)
Min Max	32.0 57.0
Missing	0
Gender	
Female	1 (5.6%)
Male	17 (94.4%)
Missing	0
Riding years	
<1 year	0 (0.0%)
1 - 5 years	0 (0.0%)
5 - 10 Years	0 (0.0%)
>10 years	18 (100.0%)
Missing	0
Motorcycle type	
Sports(including super sports/super motard)	9 (52.9%)
Scooter	0 (0.0%)
Cruiser	2 (11.8%)
Standard (including Naked)	4 (23.5%)
Touring (including Sports tourer)	3 (17.6%)
Adventure/adventure tourer/dual sport	1 (5.9%)
Off-road - trail/enduro/mx	0 (0.0%)
Other - specify	1 (5.9%)
Missing	1
Riding frequency on public roads	

Characteristics	Coach survey (N = 18)
Less than once each month	0 (0.0%)
At least once a month	0 (0.0%)
At least one day a week	0 (0.0%)
2-3 days a week	4 (23.5%)
4-6 days a week	6 (35.3%)
Everyday of the week	7 (41.2%)
2 or 3 days per month	0 (0.0%)
Missing	1
Riding hours per week	
n	17
Mean (SD)	9.0 (5.43)
Median (Q1, Q3)	10.0 (6.0, 11.0)
Min Max	2.0 25.0
Missing	1
Riding km per week	
n	17
Mean (SD)	472.9 (191.40)
Median (Q1, Q3)	500.0 (350.0, 500.0)
Min Max	190.0 900.0
Missing	1
Riding frequency on public roads >50km away from home	
Never	0 (0.0%)
Less than once a year	0 (0.0%)
About once or twice a year	1 (5.9%)
About once or twice every 3 months	1 (5.9%)
About once or twice a month	1 (5.9%)
About once or twice a week	5 (29.4%)
3 or more times a week	9 (52.9%)
Missing	1
Off-road riding frequency	
No I have never ridden off road	0 (0.0%)
Yes - I used to ride off-road but not any more	3 (17.6%)

Characteristics	Coach survey (N = 18)
Yes - but I have ridden no more than a couple of times off-road	2 (11.8%)
Yes - 1-5 times a year	7 (41.2%)
Yes - 6-11 times a year	2 (11.8%)
Yes - Monthly	2 (11.8%)
Yes - Weekly	1 (5.9%)
Missing	1
Motorcycle instructor years	
n	18
Mean (SD)	7.4 (5.55)
Median (Q1, Q3)	5.5 (4.0, 10.0)
Min Max	0.8 23.0
Missing	0
Motorcycle instructor employment status	
depends on the season	0 (0.0%)
part-time	7 (38.9%)
full-time	11 (61.1%)
Missing	0
Working days as a motorcycle instructor in the last 12 months	
n	18
Mean (SD)	143.9 (95.43)
Median (Q1, Q3)	121.5 (50.0, 250.0)
Min Max	12.0 260.0
Missing	0
Coach training in the last 5 years	
Never undertaken training courses before	3 (17.6%)
Yes I have done at least one training course for coaches/trainers in the last 5 years	14 (82.4%)
Missing	1

3.5.1.2 Coach feedback on the coach training

Coach views of the coach training are summarised in Table 46. In preparing for the role as a coach for VicRide eight coaches (44.4%) believed the coach training was about right, and eight (44.4%) believed it too short and two (11.1%) too long. Thirteen (76.5%) coaches believed the coach training was paced about right, three (17.6%) a bit too fast and one (5.9%) a bit too slow. The ratings by the coaches on nine aspects of the coach training in terms of VicRide delivery ranged from five to ten on a scale from one (very poorly) to ten (very well) with an average of 7.8 (SD=.83). The ratings by the coaches on four aspects of coaching novice riders ranged from five to ten on a scale from one (very poorly) to ten (very well) with an average of 8.3 (SD=1.2).

Table 46: Coach views of the VicRide coach training

Characteristics	**Coach survey (N = 18)**
VicRide coach training duration	
too short	8 (44.4%)
about the right length	8 (44.4%)
too long	2 (11.1%)
Missing	0
VicRide coach training delivery pace	
much too slow	0 (0.0%)
a bit too slow	1 (5.9%)
about right	13 (76.5%)
a bit too fast	3 (17.6%)
much too fast	0 (0.0%)
Missing	1
coach rating of coach training - delivery skills	
n	18
Mean (SD)	7.8 (0.83)
Median (Q1, Q3)	7.9 (7.1, 8.3)
Min Max	6.2 8.9
Missing	0
coach rating of coach training - coaching skills	
n	18
Mean (SD)	8.3 (1.24)
Median (Q1, Q3)	8.5 (7.5, 9.0)
Min Max	5.0 10.0
Missing	0

The coaches were also asked about their views of the coach training in open-ended questions. The essential themes of the responses from the coaches about the coach training are summarised in Table 47.

Table 47: Coach opinions of the coach training

Topic	Response
Key differences between rider instruction and rider coaching	All responded in different ways but essentially two themes were apparent: • Instruction is telling the students how to ride while coaches facilitate the students to find the answers themselves. • Instruction is focused on skills but coaching is focused on influencing the cognitive processes.
Remaining questions for VicRide program	Eleven out of 18 coaches had no questions. The remainder had the following questions: • Why not target learners? • Will we get better radios to communicate? • If a rider has a poor skill set to begin with, a coach may validate it rather than help with it. • How much info is too much? • How do I critique myself? • Will we have a chance to discuss how we are going with the program? • How do we target the real target audience i.e. young high risk takers who would not be interested in the program?
What worked well in the coach training	Fifteen coaches provided answers including: • The coaches "got" it. • Practicality (practicing with real students, lots of riding the route, role plays, and debrief) • Coach cue cards • Discussions (pre-ride, on-road) • Learning interaction techniques • Well structured • Feedback from students • Hearing the opinions of other instructors • Coaching style – new style of delivery • Group involvement • Good instructors • All of it
What did NOT work well in the coach training	Five out of 18 coaches thought everything worked well. The remaining coaches thought the following did not work well: • Coach training tried to mirror too much of the VicRide delivery style. However, it's better to take a more formulaic approach for coach training. • Some of the VicRide curriculum is too basic for the target group. • Using each other as students. • Training schedule ("I was trained for 3 days in 2009 and then signed off in 2 days of training with students in 2010") • Needed more time/practice on the routes (e.g. "only had a chance to

	ride half the Kylsyth route"; "The first students I saw was when I was being assessed, while running the course") • Regimented training by instructors with non-ideal personalities is not suitable to teach coaching style • On-road ride design • Radios to communicate with students • Unclear maps • No opportunity to observe how the program works in the real world • Need to use statistics to make a point • No time for recap at home
Suggestions for improving the coach training	Four out of 18 coaches had no suggestion. The remaining had the following suggestions: • A more formulaic coach training so the coaches can grasp the coaching style more quickly • Make VicRide available for learners • Course information to be provided to the coaches well before the coach training • Coach training is completed in one to two weeks. • More on-road riding practice with students • 'Training' coaches seemed to stall development of 'coaching' skills • More real-world practice of the riding routes and discussions • Extend the training by 1-2 days with a 1-2 day break in the middle.

3.5.1.3 Coach feedback on VicRide

Coaches' feedback about VicRide are summarized in Table 48. All of the coaches who responded (n=17) believed that VicRide employs just the right balance of discussion and on-road riding. The ratings by the coaches on five aspects of VicRide in helping novice riders ranged from five to nine on a scale from one (very poorly) to ten (very well) with an average of 7.6 (SD=0.6).

Table 48: Coach views of VicRide

Characteristics	**Coach survey (N = 18)**
VicRide discussion-ride balance	
Not enough discussion and too much on-road riding	0 (0.0%)
About the right balance	17 (100.0%)
Too much discussion and not enough on-road riding	0 (0.0%)
Missing	1
Coach rating of VicRide	
n	18
Mean (SD)	7.6 (0.60)

Characteristics	Coach survey (N = 18)
Median (Q1, Q3)	7.6 (7.4, 8.0)
Min Max	6.6 9.0
Missing	0

The coaches were also asked about their views of VicRide in open-ended questions. The essential themes of the responses from the coaches about the coach training are summarised in Table 49.

Table 49: Coach opinions on VicRide

Topic	Response
Groups of novice riders who would NOT benefit from the VicRide program	Half the coaches believed there were no groups of riders who would not benefit. The other half believed the following groups would not benefit: • Younger males • Overconfident riders (e.g. "I have a licence so I now know how to ride on the road", more experienced riders) • Those who volunteer to do the program • Those who are not interested • Off-road riders • Those who do not get the booklet
Other groups that would benefit from the VicRide program	All but one identified a group that would benefit from the program: • Old returning riders • Learner riders • Long-time riders without extra skills training • Scooter riders • Australia Post riders • All riders • Riders motivated to improve safety or skills • Young riders
Strengths of the VicRide program for enhancing the safety of novice riders	All but one identified program strengths: • Awareness of influence of attitudes and lack of experience on safety • Sharing experiences • Reaffirming correct ways of riding • Following an experienced rider • Inclusive discussions • Group learning • Future planning • Drawing out their own responses • Observations of riding to provide constructive feedback • Stimulate thinking about safety and their own riding
Limitations/weaknesses of the VicRide program enhancing the safety of novice riders	All but two identified program limitations: • Too short • More experienced riders can get bored in a group of less experienced riders

	• Limited by the coach abilities • One-off training • Most risk takers will not do the program • Lack of skills training • Students expect skills training • Coaching style does not suit everyone • Relies on student being motivated to learn
Suggestions for adjustments to the VicRide program	All but seven coaches provided suggestions: • Giving students multiple exposure to the VicRide concepts • Target learners or scooter riders • Better riding routes (e.g. less complicated) • Program is made available when there are enough participants • Include skills training • Better communication during rides • Allow coaches to put an example in each discussion of their own experiences • Do the course as a student before coaching • Start with roadcraft training before starting VicRide • Film students riders so they can see how they ride
Key take away messages for riders from the VicRide program	All but one identified key messages: • Take responsibility for your own riding • Have vigilance and plans for being a safe rider • Importance of accumulating experience • Critique your own riding and keep learning • Think before you do • Danger of overconfidence • Riding in groups can help you learn • Slow down

3.5.2 VicRide program delivery data recorded by HART

Of the 748 VicRide riders for whom HART provided delivery records, 28 of them were recorded as 'did not complete the VicRide program'. The reasons recorded by HART for not completing the program included ineligible (n=20), bad weather (n=5), and voluntary withdrawal by the rider (n=3). The program delivery adherence was assessed on the delivery records for the 720 riders who HART recorded as having completed the entire program (Table 50).

VicRide is designed to be run over four hours and delivered in a group of two to three riders. The actual program duration ranged from three to five hours with an average of four hours. The actual group size ranged from one to three. The majority (93.2%) of the riders participated in the program in a group of two (42.2%) or three (51.0%) riders. However, 49 (6.8%) riders participated on their own.

Most (94.3%) of the riders participated in metropolitan locations—Somerton (40.6%), Kilsyth (33.1%), and Cranbourne (20.6%). A small proportion (5.8%) participated in rural locations—Bendigo (5.1%) and

Warragul (0.7%). Weather conditions were clear with dry roads for almost 70% of the VicRide delivery occasions, and around 30% of the occasions were under some wet weather and road conditions.

All VicRide riders should have received a preparation activity booklet from HART before the actual program delivery date. Only 71.1% of riders who attended the program completed the preparation activity before the actual program participation. Reasons for not completing the preparation activity were only reported for 36.1% of those who did not complete the activity. The reasons were either that the riders did not receive the preparation activity booklet (48.6% of those who provided reasons) or riders did not have enough time (51.4%).

The coaches assessed the level of protective gear use amongst the rider participants on a scale from one (little) to three (full). The coaches assessed 64.7% of the rider participants as wearing full protective gear, 32.2% medium, and 3.1% little.

The coaches rated the participants' overall engagement during the program on a scale from one (never) to four (always). The coaches assessed 80.6% of the rider participants to be always engaged, 17.2% most of the time, and 2.2% half the time. The coaches also rated the rider participants' level of following hand signals during the course on a scale from one (never) to four (always). The coaches assessed 78.7% of the rider participants to follow hand signals all the time, 19.9% most of the time and 1.4% some of the time. This relatively low rate of following hand signals may be likely due to almost 30% of the riders not having had received or completed the preparation activity before the program participation.

The coaches recorded that for 13.2% of the participants the program had taken an alternate route. Alternate routes were required when traffic and road conditions were not considered appropriate for the coaching program purpose (e.g. heavy traffic flow or major road works). In a few cases a reason for this was noted under 'incidents with impact on program'—to stop for petrol. Some riders might not have come prepared with a full tank (it was not specified as a requirement by the participants before VicRide participation). All the participants completed the rides in light traffic conditions, heavy traffic conditions, and in metropolitan environments. Most of the participants (99.3%) also completed rides in rural environments but a small number (n=5; 0.7%) did not.

Table 50: Characteristics of participants who completed VicRide

Characteristics	**VicRide program (N = 720)**
HART program duration	
n	720
Mean (SD)	4.0 (0.21)
Median (Q1, Q3)	4.0 (4.0, 4.0)
Min Max	3.0 5.0
Missing	0
VicRide group size	
1	49 (6.8%)
2	304 (42.2%)
3	367 (51.0%)

Characteristics	VicRide program (N = 720)
Missing	0
VicRide delivery location	
Bendigo rural	37 (5.1%)
Warragul rural	5 (0.7%)
Somerton Metro	292 (40.6%)
Kilsyth Metro	238 (33.1%)
Cranbourne Metro	148 (20.6%)
Missing	0
VicRide delivery weather condition	
All clear	499 (69.3%)
Occasional heavy rain	63 (8.8%)
Clear but wet road	74 (10.3%)
Light shower	84 (11.7%)
Missing	0
VicRide delivery road conditions	
Dry	491 (68.2%)
Wet	229 (31.8%)
Missing	0
VicRide prep activity completed by participant	
No	205 (28.9%)
Yes	505 (71.1%)
Missing	10
VicRide prep activity non-completion reason	
None	19 (20.4%)
Book not received	36 (38.7%)
Not enough time	38 (40.9%)
Missing	627
VicRide protective gear use	
Low	22 (3.1%)
Medium	232 (32.3%)
High	465 (64.7%)

Characteristics	VicRide program (N = 720)
Missing	1
VicRide hand signals followed	
Never	0 (0.0%)
Some of the time	10 (1.4%)
Most of the time	142 (19.9%)
All the time	562 (78.7%)
Missing	6
VicRide participant engagement	
Never	0 (0.0%)
Half the time	16 (2.2%)
Most of the time	123 (17.2%)
Always	578 (80.6%)
Missing	3
VicRide delivery alternative route taken	
No	624 (86.8%)
Yes	95 (13.2%)
Missing	1
VicRide metro route completed	
No	0 (0.0%)
Yes	719 (100.0%)
Missing	1
VicRide rural route completed	
No	5 (0.7%)
Yes	714 (99.3%)
Missing	1
VicRide light traffic condition completed	
No	0 (0.0%)
Yes	719 (100.0%)
Missing	1
VicRide heavy traffic condition completed	

Characteristics	VicRide program (N = 720)
No	0 (0.0%)
Yes	719 (100.0%)
Missing	1

3.5.3 Rider participant feedback on VicRide

Of the 1232 VicRide riders, 1061 (86.1%) were successfully followed up for the second interview and 704 riders (57.1% of the original VicRide riders) reported they had completed VicRide. The 357 (29.0%) VicRide riders who were successfully followed up for the second interview but had not completed VicRide were asked in an open-ended question about the main reason for non-completion. The main reasons are summarised in Table 51. A more detailed table including keywords used for coding and example responses are provided in Appendix 7.

After the HART program delivery data and the rider participant feedback data were merged, some discrepancies between the two data sources were found. Explanations were sought from HART ad hoc and they are provided in Appendix 9.

Table 51: VicRide group rider self-report on why they did not complete VicRide.

Reason for not completing the program	Description	Proportion
Work	Riders had work.	23.1
Bike unavailable or inappropriate	The riders had no access to a HART approved motorcycle (including off-road bike) or because they were turned away after their bikes were examined by HART. This included responses that indicated the rider's bike was in a state of repair that was mechanically unsuitable. Note: If they did not have a bike available due to non-registration, then the response was coded as 'unregistered bike'.	18.8
Lack of time/ commitment	The riders were unable to make time to participate in the course. Note: This code is used in preference to 'Course timetable unsuitable' when the rider attributes the reason to themselves not finding time, rather than to the timetable set by HART. If the riders specified work as a reason for non-participation, this response is categorised under 'Work'.	17.0
Course timetable unsuitable	The program was not available at the times riders would have liked to do the course. If work was the reason for the timetable being unsuitable, it was coded as 'work'.	8.7
Expected HART to contact	The riders were waiting for HART to call to arrange a course time. If the course was arranged with the rider but it was rearranged and some miscommunication occurred between HART and the rider (e.g. waiting to be called back for an alternative time after cancellation) it is coded as 'Mistake with the booking'.	7.9

Health problems	The riders did not complete the program due to health issues or as a result of injuries from a motorcycle accident.	7.4
Course location unsuitable	The location of the program was not easily accessible.	7.0
Forgot	The riders had forgotten to participate in the course.	6.6
Away	The rider was not in their usual residence to come to the program location.	3.9
Unregistered bike or invalid licence	The motorcycle was not registered at the time of program participation, or the riders did not have a valid licence.	3.5
Mistake with the booking	HART had provided the rider with the incorrect course date or location, or made changes without consulting with the rider.	3.1
Problem with $50 deposit	Participants did not want to book because they had to pay a deposit.	2.2
Personal issues/family issues	The riders expressed that they were unable to complete the course due to personal issues such as the death or illness of a family member.	2.2
Other	An ambiguous response or a rare reason that does not fit into any other category.	2.1
Festive season	Riders were required to complete the course during the Christmas/ New Year time.	1.7
Weather/season not suitable	Bad weather or unsuitable season stopped riders from participating in the course.	1.3
Lost reference number	Riders lost their reference number and this held them back from arranging a booking.	1.3

Those VicRide riders who reported they completed the program (n=704) were asked a series of questions about their experience of VicRide participation. The results are summarised in Table 52.

The total satisfaction score ranged from 1.94 to 4 with a mean of 3.2 (SD=.42) based on a 16-item questionnaire with a four-point rating scale from strongly disagree to strongly agree. This mean equates to eight out of 10. In terms of the program duration, most riders (n=573; 81.4%) believed it was about right. However 114 (16.2%) riders believed it was too short, and 17 (2.4%) too long. With respect to the speed of the on-road rides, most riders (n=613; 87.2%) believed it was about right. However, 77 riders (11.0%) believed it was a bit too slow, 8 riders (1.1%) much too slow, and 5 riders (0.7%) too fast. Most riders (n=620; 88.1%) believed VicRide employs the right balance of discussion and on-road riding. However, 58 riders (8.2%) believed there was too much discussion and not enough on-road riding, while 26 riders (3.7%) believed there was not enough discussion and too much on-road riding.

Table 52: VicRide participant feedback

Characteristics	**VicRide program (N = 1061)**
Program completed or not	
No	357 (33.6%)
Yes	704 (66.4%)
Missing	0

Characteristics	VicRide program (N = 1061)
VicRide participant satisfaction scale score	
n	704
Mean (SD)	3.2 (0.42)
Median (Q1, Q3)	3.1 (2.9, 3.5)
Min Max	1.9 4.0
Missing	357
VicRide course duration	
Too long	17 (2.4%)
About the right length	573 (81.4%)
Too short	114 (16.2%)
Missing/Don't know/Refused	357/0/0
On-road riding speed	
Much too fast	0 (0.0%)
A bit too fast	5 (0.7%)
About right	613 (87.2%)
A bit too slow	77 (11.0%)
Much too slow	8 (1.1%)
Missing/Don't know/Refused	357/1/0
Discussion-ride balance	
Not enough discussion and too much on-road riding	26 (3.7%)
About the right balance	620 (88.1%)
Too much discussion and not enough on-road riding	58 (8.2%)
Missing/Don't know/Refused	357/0/0

VicRide participants were also asked in open-ended questions what they would like to have seen done differently and what they liked about the program. These responses are summarised in Tables 53 and 54. More detailed tables including keywords used for coding and example responses are provided in Appendix 7.

Table 53: VicRide program participant self-report on what they would like to have seen done differently.

What riders would like done differently	Description	Proportion
Nil	Riders had no suggestions.	21.7
More focus on riding	Riders wanted more skills or technique development,	19.9

techniques/ skills	such as cornering, turning, braking, vehicle control.	
More constructive/ critical/ personalised feedback	Riders wanted more feedback on their riding. Some responses specifically described the feedback to be, personalized, individual, critical and/or constructive, or to be given at the end of rides.	12.2
Longer course duration	Riders wanted the whole course to run for a longer period of time. Note: If the responses mentioned they wanted the program to be longer but also gave a suggestion of how the program could be structured such as running over a few days, these were categorised as 'Different course structure or content' and 'Longer duration'. If the response was not referring to structure then the response was categorised as 'longer duration'.	11.7
More varied riding conditions (road surface, time of day)	Riders wanted to gain more experience across various roads and times of day during the course.	10.7
Practice in simulated challenging situations	Riders wanted the course to include challenging situations such as emergency situations.	8.4
Group of similar age, gender, or riding experience	Riders preferred the group to be composed of riders similar to them in terms of age, gender and/or riding experience.	7.9
Higher level training	Riders indicated that the current course was too simple/basic, or more suitable for less experienced riders, or they wanted a harder/more advanced program.	7.1
Other	Ambiguous response that cannot be interpreted by any coder.	6.4
More one-on-one coaching	Riders explicitly wanted the 'one-on-one' aspect of coaching.	5.9
Receive the handbook before the program	Riders wanted to receive the handbook before the course or use the handbook during the program.	5.1
Different target group	Riders wanted a different target group e.g. scooter riders to be included; younger riders; less experienced or learner riders.	4.1
Larger group	Riders wanted to do the course with a larger group of riders.	3.6
Better assessment or help with setting up the bike by the coach before riding	Riders wanted to learn how to set up the bike before riding e.g. adjusting mirrors, and a more detailed check of the bike	3.1
More discussion	Riders wanted more time spent on discussion. Responses may also specify the timing of the discussion (before, after, or during the rides).	3.1
More rider input	Riders wanted the coach to be less instructive; make less observation or evaluation of their riding; allow the riders to talk more; provide more opportunities to ask questions or take notes, or wanted a greater role in the direction of the program such that the program focuses on the problems that the participants are having and on what the participants want to improve on.	2.9
More convenient course location	Riders mentioned that the course location was too far	2.8

	away or inconvenient to get to.	
Course tailored to individual needs	Riders wanted the course to be more tailored to the individual needs of the riders.	2.6
Better technology to allow effective communication with everyone during the rides	Riders specifically mentioned that better technology is required for communication on-road. Note: This is distinct from 'Communication with everyone during the ride' in that the respondents specified technology in their response.	2.3
More input/ guidance/ instruction from the coach	Riders wanted more instruction or tips from the coach.	2.1
More rides with less discussion	Riders wanted more time spent on on-road rides and less on discussions. Responses must include BOTH more riding AND less discussion. If responses only refer to longer rides – use 'longer duration'.	2.0
Follow-up learning opportunities	Riders wanted further learning opportunities after the present course, such as a follow-up ride or additional courses.	2.0
Coach leading the rides	Riders wanted the coach to lead the on-road rides.	1.8
More theory	Riders wanted more time spent on theory. This may include the specification of the inclusion of information about the major causes of crashes.	1.8
Tracks Training	Riders wanted to do the program on a track/course.	1.8
Different program structure or content	Riders requested for a more structured course delivery. They may specify more 'goal setting', clearer 'learning outcomes', or focus on different aspects of riding one at a time during each ride. Note: If the responses indicated that they wanted the program to be longer but also gave a suggestion of how the program could be structured such as running over a few days, these were categorised as 'Different course structure or content' and 'Longer duration'.	1.8
Communication with everyone during the ride	Riders wanted to be able to talk to other riders whilst on-road.	1.5
Lunch	Riders wanted lunch provided or a lunch break	1.5
Mandatory	Riders wanted the course to be mandatory for riders.	1.5
More prior information about the course	Riders wanted more information on the course schedule before participation, e.g. Lunch breaks; goal setting; on-road riding routes.	1.5
Smaller group	Riders wanted a smaller group.	1.5
Bad weather back-up plans	Riders wanted back-up plans for bad weather (rain, thick fog) on their booked program date.	1.5
Age/gender appropriate contents or delivery	Riders wanted the course contents/delivery to be age-appropriate in terms of program appeal to certain age groups (old, middle-aged, young), or have a female coach for female riders.	1.0

Table 54: VicRide participant self-report on what they like about VicRide.

What riders liked about the program	Description	Proportion
Coach quality (Knowledge; group engagement; professional; experienced; helpful; friendly)	Participants liked the coach's quality including knowledge; experience; efficiency; professionalism; gender; friendly and/ or helpful manner. If the rider identified the coach-rider interaction in general as something s/he liked, such a response was also coded under this category. Participant liked the manner/style of delivery/teaching/coaching. If the participant liked the structure or format of the course, or generally refers to the course being well run #47.	20.1
Receiving feedback	Participants liked obtaining feedback on their riding from the coach and/ or other riders. Some participants identified 'constructive' and 'personalized' to be the attractive features of the feedback.	17.4
Group discussions	Participants liked the discussion with other group members. Responses may specifically refer to discussions during or after the ride.	16.1
Varied riding conditions or roads and/or routes	Participants liked to ride in different conditions such as varying weather, traffic and road conditions (surfaces), rural/urban settings, and different roads they were unfamiliar with. Participants liked the route(s) taken on the rides.	13.0
New skills and learning	Participants liked learning new skills or receiving tips. Respondents may refer to learning in general (e.g. "A few things I learned which were good" or they may specifically refer to Road craft or bike positioning and other techniques. 'Tips' are distinguished from 'feedback' by the words used in the responses. Note: If they specifically mentioned Hazard Perception or safety, it is categorized under 'Hazard checking and/or safety tips'.	9.5
Group rides	Participants liked the group ride component of the program.	7.7
Increased confidence	Participants liked that their skills and beliefs were reinforced; and/or that it increased their confidence on-road.	5.5
Course structure and delivery format	Participants liked the organized structure and/or the delivery format (e.g. practical and theoretical nature of the course, review material sent to them post-course, bike check prior to the course, rider-oriented). If the participant liked the coach quality specifically, code 'Coach quality'.	5.4

Socialization with other riders	Participants liked that they could interact/ socialize with other riders.	5.3
On-road rides	Participants liked that the rides were on-road.	5.3
Group size	Respondents indicated satisfaction with the size of their group. This may be a generalized or specific comment. Respondents may indicate whether they enjoyed having a small or large group.	5.1
Hazard checking or safety tips	Participants liked learning hazard perception skills, and/or safety tips. When participants did not specify Hazard Perception or safety, then the response is coded under 'New skills and learning'.	4.2
Informative	Participants liked that the program was informative, and/or the information provided at the beginning of the course.	3.3
Relaxed environment	Participants liked the relaxed, informal, or friendly learning environment.	3.1
Interaction with the coach	Respondents liked that they were able to interact with the coach. Interaction with the coach refers to actual coaching, which is distinguished from interactions with the other riders – which are interpreted as discussion (code 32 or 35) or socialization (code 24). Some respondents specify one-on-one interaction with the coach.	3.1
Question and answer time	Participants liked the question and answer time.	2.9
Riders liked following the coach/other riders and modeling their riding behaviour	Participants liked to follow coach/other riders on-road, and get on-road instruction(s)/ demonstrations	2.6
Focus on rider attitudes and self-awareness	Participants liked that the program focuses on rider attitudes/ awareness/ perspectives in relation to riding. Some responses may refer to self-assessment of skills and ability.	2.4
My riding being observed or taking turns to lead and observe the rides	Participants liked being observed whilst riding or taking turns leading the group on-road.	2.2
Well matched group (by experience; a common goal	Participants liked that they were placed into a group of riders with similar experience, goal, or problems.	1.8
General enjoyment	Participants liked the course in very general.	1.5
Access to other experienced riders	Participants liked having access to experienced riders other than the coach.	1.1
Course duration	Participants liked the length of the course.	1.1
Crash statistics	Participants liked being provided with the statistics on motorcycle crashes.	1.1
HART as a delivery organization	Participants liked that HART was the delivery organization and/or that it was a reputable delivery company	1.1
Other-ambiguous response	Ambiguous response that cannot be interpreted by coders.	1.1

Nothing	Participants didn't like the program.	0.7

3.5.4 Study participant feedback on what makes a program like VicRide attractive

All study participants were asked at the end of Interview-2 to comment on what would most likely to attract them to doing a course like VicRide if it were offered to them and they were not in this trial. These responses are summarised in Tables 55. A more detailed table including keywords used for coding and example responses are provided in Appendix 7.

Table 55: Study participants' feedback on what would attract them to doing a course like VicRide.

Attraction factor to do a course like VicRide	**Description**	**Proportion**
Development or improvement of riding skills/ability	A response that specifically expressed riding skills or ability as the attraction. Some respondents specified the types of skills, which included bike handling skills, road craft, manoeuvres, cornering skills, throttle control, and some responses also referred to learning more advanced skills in general. *Note.* If the respondent referred to safety skills (e.g. "skills that will keep me safe"; "to stay alive by learning the skills") the response was categorised as "Development or improvement of riding skills or ability" and "Safety focus".	27.6
Safety focus	Hearing about statistics on motorcycle related deaths and injury or a safety message.	24.2
Access to an experienced rider	Access to someone who is a more experienced rider than themselves (mostly the coach but sometimes other riders in the group) whether the access be speaking to them, riding with them, getting tips from them, having their experience shared with the respondent	18.7
Incentives offered for participation	Receiving incentives such as group deals, reduced licence restrictions, discounts on registration, insurance, or motorcycle goods, or accreditation on your licence to signify that you completed the program.	8.8
Development or improvement of riding experience	Gaining more riding experiences as the attraction. Some responses added experience in 'different situations' or referred to riding in different areas/terrains.	8.4
Program fee	Monetary cost of participation. Some respondents just referred to 'cost' or 'fee' while others specified it to be low cost, affordable, or free.	8.3
Interest in self-improvement or development as a rider	Having a general interest in improving oneself as a rider but did not identify the improvement in relation to 'experience', 'knowledge', 'awareness', 'skill', 'ability', or 'confidence' specifically.	7.8
Feedback or guidance on my riding	Receiving feedback or guidance on their riding. *Note.* Some respondents also specified the	7.2

	attractiveness of who the feedback comes from – in such instances "Access to an experienced rider" was also assigned.	
Marketing of the program	Course information or the existence of the course made known to the respondent. Some respondents specified 'good marketing', 'advertising campaign', and the like but others just expressed being told the program exists or what they would get out of the program and how it would benefit them personally.	4.7
On-road rides	On-road riding or practical learning. The aim of on-road rides in VicRide is to make the program practical and allow participants to experience riding in realistic conditions, as opposed to the traditional classroom. Hence any response that expressed this aspect of real world experience is coded as this category.	4.6
Development or improvement of riding knowledge or awareness	A response that specifically expressed the cognitive aspects of riding such as knowledge, awareness, and understanding. Note: Responses that gave mention to good/ new/more tips without referring to another rider/ experienced rider were assigned to this category.	4.5
Group rides	Riding in groups or the social aspect of meeting other riders.	3.8
Convenient program delivery location	Convenience of the program delivery location. Commonly the respondents identified convenience as 'easy to get to'	3.4
Evidence of program effectiveness	Hearing about the evidence for the program effectiveness.	2.9
Development or improvement of riding confidence	Feeling the lack of riding confidence or increasing riding confidence.	2.9
Hazard perception	A response that specifically referred to spotting hazards/dangers or learning how to respond in hazardous or emergency situations	2.8
Recommendation from others or peer pressure	Having the program recommended to them whether it be other riders, friends, mechanic, or other riders who had completed the program, or encouragement from family or friends to participate.	2.4
Tailored to individual needs	A response that expressed the importance of personalized or individualised education style (one-on-one) or the program contents being on par with the respondent's riding level. Some respondents expressed 'direct', 'concentrated', 'intensive' tuition.	2.3
Mandatory participation	Mandatory participation or a requirement as part of obtaining or keeping a motorcycle licence.	2.3
Flexible or convenient program schedule	Flexibility of the delivery schedule – some respondents expressed the course to be delivered outside business hours or at times suited to themselves, or having the option to complete the program over a few days.	2.0

Offered to newly licensed riders	Offered in the earlier stages of their licensing. Some responses also mentioned if it was advertised to them shortly after obtaining their licence.	1.7
Group size	A response that specifically referred to group size.	1.1
Other	Ambiguous response that cannot be interpreted by any coder.	1.1
Previous crash experience	The rider him/herself having had a crash or someone they know having had a crash. Responses also included experiences of escaping a crash.	1.0
Program duration	Program duration – some respondents specified the length (e.g. "2 days of 5 hours each"; ""400km bike ride") or specified which components they preferred to be longer (e.g. "length of the ride")	0.9
Reputable delivery organisation	Reputation of the delivery organisation	0.8
Group discussion	Group discussion or an opportunity for riders to talk/ask questions.	0.7
Group mix	Group mix such as riding with riders of similar riding experience level, similar age, or same gender.	0.7
Fun	A response that expressed the fun aspect.	0.7
Off-road riding	Rides taking place on a motorcycle track or race course.	0.6
Nothing	Responses that did not specify any factors that would contribute to their participation in a VicRide course. Some respondents indicated that they were not interested in partaking in the course, or that there was nothing they could suggest for improvement.	0.6
Motorbike provided	A motorbike to be provided for the course – some highlighted the appeal of trying out a new bike.	0.3

3.6 Economic evaluation

3.6.1 Willingness to pay for VicRide

All the Interview-2 respondents provided a willingness to pay (WTP) value for VicRide and the data are summarised in Table 56.

The WTP ranged from 0 to 1000 with a mean of $175 (SD=137.8). The certainty of the WTP choice ranged from one to ten with an average of 8.1 (SD=2.0). The certainty level did not differ statistically significantly between the VicRide group (8.2; SD=2.0) and the control group (8.0; SD=2.0). The certainty level was very high across all study participants. Therefore all WTP values were used in subsequent analyses.

Table 56: WTP for VicRide

Characteristics	Control (N = 1067)	VicRide program (N = 1061)	Total (N = 2128)
Highest willingness to pay amount			
$0	33 (3.1%)	40 (3.8%)	73 (3.4%)
$20	0 (0.0%)	1 (0.1%)	1 (0.0%)
$25	39 (3.7%)	45 (4.2%)	84 (3.9%)
$50	121 (11.3%)	184 (17.3%)	305 (14.3%)
$100	213 (20.0%)	224 (21.1%)	437 (20.5%)
$150	177 (16.6%)	150 (14.1%)	327 (15.4%)
$200	240 (22.5%)	232 (21.9%)	472 (22.2%)
$300	145 (13.6%)	124 (11.7%)	269 (12.6%)
$500	80 (7.5%)	53 (5.0%)	133 (6.3%)
$550	2 (0.2%)	0 (0.0%)	2 (0.1%)
$600	6 (0.6%)	3 (0.3%)	9 (0.4%)
$700	3 (0.3%)	1 (0.1%)	4 (0.2%)
$750	0 (0.0%)	1 (0.1%)	1 (0.0%)
$800	2 (0.2%)	0 (0.0%)	2 (0.1%)
$1,000	6 (0.6%)	3 (0.3%)	9 (0.4%)
Missing/Refused	0/0	0/0	0/0
Highest willingness to pay amount			
n	1067	1061	2128
Mean (SD)	188.2 (146.33)	161.7 (127.29)	175.0 (137.77)
Median (Q1, Q3)	150.0 (100.0, 200.0)	150.0 (50.0, 200.0)	150.0 (100.0, 200.0)
Min Max	0.0 1000.0	0.0 1000.0	0.0 1000.0
Missing	0	0	0
Certainty with the WTP amount selected			
n	1063	1056	2119
Mean (SD)	8.0 (1.99)	8.2 (1.95)	8.1 (1.97)
Median (Q1, Q3)	8.0 (7.0, 10.0)	8.0 (7.0, 10.0)	8.0 (7.0, 10.0)
Min Max	1.0 10.0	1.0 10.0	1.0 10.0
Missing/Don't know/Refused	0/4/0	0/5/0	0/9/0

The average WTP was lower amongst the VicRide riders ($162; SD=127.3; n=1061) than the control group riders ($188; SD=146.33; n=1067). Further analyses showed that the highest WTP amount for VicRide was statistically significantly lower for the VicRide group than the control group, even after accounting for age, gender, and riding exposure (adjusted beta coefficient=-0.277; p<.0001). The statistically significant program effects are highlighted in bold italics in Table 57. That is, the VicRide group valued VicRide less than the control group. These results are shown in Table 57.

Table 57: Linear regression of highest willingness to pay amount at Interview-2

	Univariate estimates		**Adjusted estimates**	
Variables	**coefficient (95% CI)**	**P-value**	**coefficient (95% CI)**	**P-value**
Program (VicRide vs. Control)	***-.264 (-.381, -.148)***	***<.0001***	***-.277 (-.393, -.161)***	***<.0001***
Age	0.019 (0.014, 0.024)	<.0001	0.018 (0.013, 0.023)	<.0001
Gender (Male vs. Female)	-.130 (-.278, 0.019)	0.0880	-.051 (-.200, 0.098)	0.5000
Riding exposure (hours/week)	-.031 (-.047, -.015)	0.0001	-.027 (-.042, -.011)	0.0010

The main reasons for the WTP choice by the nine pre-set response categories are summarised in Table 58. When the pre-set categories did not apply, 'other' was entered and the reasons were recorded in free text (n=206). Some 'other' reasons in free text were subsequently coded as the same pre-set response categories but most of them introduced new themes, as shown in Table 59. A more detailed table including keywords used for coding and example responses are provided in Appendix 7.

Table 58: Reasons for the WTP amount selected

Reason for the WTP amount selected	**Control (N = 1067)**	**VicRide program (N = 1061)**	**Total (N = 2128)**
Reduction in crash risk is not important to me	6 (0.6%)	7 (0.7%)	13 (0.6%)
That's not enough crash reduction for me	6 (0.6%)	11 (1.0%)	17 (0.8%)
That's how much the course is worth to me	329 (31.0%)	358 (33.9%)	687 (32.4%)
It's something Government should pay, not me	34 (3.2%)	26 (2.5%)	60 (2.8%)
I don't believe such a course will make a difference to crash risk	16 (1.5%)	15 (1.4%)	31 (1.5%)
I want to learn more riding skills and this is a good way to do it	284 (26.7%)	249 (23.6%)	533 (25.2%)
I value safety	152 (14.3%)	145 (13.7%)	297 (14.0%)
I just don't have a lot of spare cash	133 (12.5%)	141 (13.3%)	274 (12.9%)
I want to finish the interview as quickly as possible	1 (0.1%)	0 (0.0%)	1 (0.0%)
Other	101 (9.5%)	105 (9.9%)	206 (9.7%)
Missing/Don't know/Refused	0/5/0	0/4/0	0/9/0

Some protest responses existed where the highest WTP amount nominated was '0' and the main reason was 'It's something Government should pay, not me' (n=23), "It should be free for everybody' (n=1), 'I have already paid to get my licence' (n=2), 'I want to finish the interview as quickly as possible' (n=1). However, overall this was minor (n=27; 1.3%).

Table 59: Summary of 'other' reasons for the WTP amount selected

Other reason	Description	Proportion of 'other'
Good value for money, reasonable for what you get, affordable	The respondent believes the amount makes it reasonable, good value for money, or affordable.	32.8
Comparable price to other existing programs or licensing costs	It is comparable to the price of other programs they know of, including more/less advanced courses than VicRide, driver courses, and courses of similar level/duration to VicRide, or comparable to licensing costs/test.	24.3
It would attract the right audience	The chosen price would attract the 'right audience' according to the respondent's perceptions.	9.0
Price I'd pay considering motorcycle licensing and other related costs	The price the respondent would pay after considering the expenses related to motorcycle riding (e.g. licensing costs, bike, protective gear).	7.9
The program may not benefit me or other riders	The rider does not believe the program will benefit themselves or some other riders (e.g. New riders or advanced riders). If the response specifically refers to crash risk then it is coded as 'I don't believe such a course will make a difference to crash risk'.	7.6
I value safety (pre-set category)	The price the respondent would pay for safety.	4.0
Other – ambiguous response	A response that is not related to the question, out of context, ambiguous, or 'don't know'. Other rare responses were also included.	4.0
That's how much the course is worth to me (pre-set category)	The value simply represents how much the course is worth to the respondent, without identifying specific reasons.	3.4
It's something Government should pay, not me (pre-set category)	In-principle refusal to pay out of pocket because they believe the government should pay.	2.3
I just don't have a lot of spare cash (pre-set category)	The respondent does not have/earn much money.	2.3
I don't believe such a course will make a difference to crash risk (pre-set category)	The respondent does not believe in the value of the course specifically in terms of crash risk.	1.7
I have plenty of money	Money is not an issue for the respondent.	1.7
I want to contribute to professional services	A response indicating the desire to pay the trainers for their professional service.	1.7

3.6.2 Cost-benefit of VicRide

Given VicRide program was not shown to be effective in reducing the number of crashes (police-report or self-reported), a cost-benefit analysis was not conducted.

4. Summary of Results and Discussion

In this section results are first discussed in relation to process evaluation, outcome evaluation, and economic evaluation separately, followed by discussion of the overall results.

4.1 Process evaluation

4.1.1 Coach feedback on the coach training and VicRide program

The results on coach feedback on the coach training and VicRide were presented in Section 3.5.1 and Tables 45-49. The VicRide coaches were experienced riders and trainers with an average of over 10 years of riding experience and an average of 7.4 years of being rider trainers. Most coaches believed the coach training was either too short or just right, but they generally rated the training highly with average scores of 7.8 out of 10 for delivery skills and 8.3 out of 10 for coaching skills.

The coaches' description of the differences between 'instruction' and 'coaching' showed two themes: 1) Instruction is telling the students "how to" while coaches facilitate the students to find the answers themselves; 2) Instruction is focused on skills but coaching is focused on influencing the cognitive processes. These suggest coaches had grasped the underlying principle of the VicRide teaching method.

The coaches generally rated VicRide highly with an average score of 7.6 out of 10.

All these results suggest that the coach training was delivered adequately to equip the coaches with the required delivery and coaching skills and good understanding of the 'coaching' style as opposed to 'instruction' style of teaching. The VicRide coaches were also very experienced riders and trainers.

4.1.2 VicRide program delivery data recorded by HART

The results on VicRide delivery as recorded by HART were presented in Section 3.5.2 and Table 50. According to HART, 58.4% (n=720) of the VicRide group completed the entire VicRide program.

The actual delivery seemed to adhere to the intended design on most aspects: 1) the program ran for an average of four hours; 2) 93.2% of the participants were in a group of two or three (however, 6.8% participated solo); 3) coaches assessed 98.6% of participants followed hand signals most or all of the time; 4) coaches assessed 97.8% of the participants to be engaged most or all of the time; 5) close to 100% completed the metro and rural riding routes; 6) 100% completed riding in light and heavy traffic conditions.

However, it was notable that 30% of the participants had not completed the preparation activities, indicating a rather low adherence to a potentially critical component of the program. This suggests that in order to maximise control of the delivery and to cater for all levels of participant motivation all learning opportunities should be contained within program attendance. Therefore it may be best to have no requirement of pre-preparation in future programs.

The fact that such a high proportion of participants had not completed the required preparation activity may have negatively impacted the program outcomes. Further only around 60% completed the program. Taking into account that only 70% of program participants completed the pre-program activity work, then

only about 40% (70% of 60%) of the intention-to-treat group actually received the full program including the preparation activity. This suggests the program was not fully implemented as intended by the program design.

The low percentage of participants who completed the program itself among the VicRide group has several implications. Without participation being mandatory, the ability of programs such as VicRide to be fully implemented and reach all of the target audience is likely to be challenging. This was a research trial and therefore participation could not be made mandatory. For the purpose of the research trial, the lack of program participation may reflect that the reimbursements provided for participation were not sufficient for the participants to justify their participation. However, in addition to the $90 reimbursement provided to all participants (VicRide and control riders), the VicRide riders who completed the program within six weeks of the baseline interview were also provided with a $50 payment. These were considerable reimbursements for a large scale research trial such as this. Therefore, this experience suggests training programs such as VicRide are particularly challenging to standardise and implement as a state-wide intervention, at least when optional only.

It cannot be established from the current study which individual components (participant expectations, coach quality, program duration, preparation activities, administration processes, etc) are key to achieve effectiveness in terms of reductions in crashes and risk taking behaviours and attitudes. Resource intensive study designs (comparisons of multiple arms of intervention groups with different combinations) would be required to pinpoint key components that lead to effectiveness or lack thereof.

Overall the HART delivery data suggest most aspects of the program were delivered as intended by the design. The only significant non-adherence appeared to be the low completion rates of the preparation activities before the day of the program rides.

4.1.3 Rider participant feedback on VicRide

The results on VicRide program participant feedback were presented in Section 3.5.3 and Tables 51-54. Of the VicRide group who were successfully followed up for Interview-2, 57.1% (n=704) reported they had completed VicRide.

Although the reasons varied widely, the top three reasons reported by the VicRide group for not completing the program were work (23.1%), no bike (18.8%), and lack of time (17%). While some reasons were due to required aspects of the trial (lost reference number to book), most reasons for not completing the program could be avoided in future if the program was compulsory or part of obtaining the licence (e.g. work, lack of time, forgot, away, expected HART to contact the rider to set up a time, course timetable not suitable, personal issues, festive season).

The VicRide riders who actually completed the program rated it highly with an average score of 8 out of 10. Most riders believed the VicRide program was about the right duration (81.4%) and pace (87.2%), and had the right balance of discussion and on-road rides (88.1%). Although the views varied widely, the top three comments on what the VicRide participants liked about the program were ‘coach quality’ (20.1%), ‘receiving feedback’ (17.4%), and ‘group discussion’ (16.1%). These features are in line with the intended design of the VicRide program.

Although the views varied widely again, the top three comments on what the VicRide participants would like to have seen done differently were 'nothing' (21.7%), 'more focus on riding skills/techniques' (19.9%), and 'more feedback' (12.2%). The VicRide program was not intended as a skills training program, but some newly licensed riders may expect and desire a skill-based training than a cognitive-based coaching such as the VicRide program.

The results on feedback from all the study participants were presented in Section 3.5.4 and Table 55. Although the views varied widely, the top three comments on what factors would be most likely to attract them to doing a course like VicRide if it were offered to them and they were not in this trial were 'development or improvement of riding skills' (27.6%), 'safety focus' (24.2%), and 'access to an experienced rider' (18.7%). Similarly to above, newly licensed riders may expect and desire a skill-based training than a cognitive-based coaching such as the VicRide program. The program however had a safety focus and involved access to an experienced rider (i.e. coach) as key features, consistent with rider preferences.

Program participant feedback suggests the VicRide program was received reasonably well and the features they liked most about VicRide were in line with the intended design of the program. However, it was notable that what riders want from a program like VicRide vary widely and there are about 20-30% of riders who are particularly interested in skills training.

4.2 Outcome evaluation

The results on outcome evaluation were presented in Section 3.4 and Tables 2-44. Given the results of the supplementary sensitivity analyses (Section 3.4.3 and Appendix 8) were broadly consistent with the results of the main intention-to-treat analyses, which suggests the robustness of the main results, the results are discussed in relation to those main findings of the intention-to-treat analyses.The main finding of the study was that VicRide did not have an effect on crashes, either police reported and self-reported. However, the VicRide group did report significantly fewer near misses/close calls, more riding hours in an average week, more confidence in riding skills, more attribution of crash causes to riders rather than drivers and more speeding behaviours than control riders, after accounting for the effects of age, gender, and riding exposure.

These findings are consistent with the driver training literature, which shows no evidence for effectiveness of post-licence training in reducing road traffic injuries or crashes (Lund and Williams 1985, Ker, Roberts et al. 2003, Ker, Roberts et al. 2005). It is also consistent with previous rider training literature that suggests no evidence for rider training in crash risk reductions, though this is at least in part due to the absence of a strong body of methodologically rigorous evaluations (Kardamanidis, Martiniuk et al. 2010).

HART delivery data and feedback from the VicRide group indicated that only about 60% of the participants randomly allocated to the VicRide group actually completed the program. A weak dose of the intervention in the VicRide group is likely but the present outcome evaluation ensured statistical analyses which maximised power for detection of effects and supplementary sensitivity analyses were also conducted to check the possible impact of a weak dose of VicRide.

In order to maximise the statistical power, composite outcomes of at least one police-recorded or self-reported crash at 3-month and 12-month follow-up respectively were used to evaluate the effectiveness of VicRide. The program effect was also assessed in terms of police-recorded crashes, self-reported crashes, and self-reported injury crashes individually. None of them was statistically significant, further supporting the nil effect of VicRide on crashes. Program effects were also assessed in terms of number of days to the first police-recorded crash event from baseline interview, but no statistically significant effect was found.

The program effects were all assessed accounting for time to follow-up and the three common risk factors for crashes of age, gender and riding exposure (Blockey and Hartley 1995, Özkan, Lajunen et al. 2006, de Winter and Dodou 2010). Although time to follow-up (i.e. days between baseline and the two follow-up time-points) was broadly consistent they varied slightly between participants depending on their availabilities for the follow-up interviews among all participants and program participation among the VicRide group. Time to follow-up may impact the outcomes of interest and was therefore included as an offset variable in all the regression models. Given the results of the supplementary sensitivity analyses (Section 3.4.3 and Appendix 8) were broadly consistent with the results of the main intention-to-treat analyses, the results are discussed in relation to those main findings of the intention-to-treat analyses.

Although at the time of study design, there were few studies available that reported on crash rates in provisional riders in Australia, we assumed a a composite crash outcome (at least one police-recorded crash or self-reported crash) of 22%. Recent as yet unpublished work by de Rome et al[14] from a representative sample of motorcycle riders in NSW found a self-reported crash rate (including minor spills) in provisional-1 riders of 28% in the past 12 months, suggesting our trial would be well powered to find an effect on the primary outcome. However, the composite crash rate was found lower than anticipated, at 11.6%. However, no evidence of any effect on crash outcomes was detected, and as we found participation in the program led to statistically significant increases in behaviours that are associated with increased crash risk, such as speeding, unrealistic confidence and increased riding time, it is unlikely that even with a much larger sample size that any crash reduction would be present.

The numbers of police-recorded offences overall, car offences only, and bike offences only in the 12-month follow-up period were compared between the VicRide and control groups. None of these was statistically significant. That is, VicRide did not have an effect on police-recorded offences. This is not exactly consistent with driver training literature, which suggests slight reductions in traffic offences after driver training (Lund and Williams 1985, Ker, Roberts et al. 2003).There was a statistically significant increase in self-reported speeding behaviours in the Vicride group as measured by the MRBQ, , after accounting for the effects of age, gender, and riding exposure. However, no statistically significant effect was found on police-recorded offences. The lack of consistency between police-recorded offences and MRBQ speeding behaviour scale may reflect the limitations in on-road detections rather than a genuine lack of validity of this MRBQ scale. This is consistent with other research such the SARTRE 4 Pan European survey, which found over half of European drivers self-report speeding (56%) but only a minority (23%) have been fined for speeding offences (Vardaki and Yannis 2013)

[14] de Rome L, Fitzharris M, Baldock M, Fernandes R, Ma A, Brown J. Risk factors for motorcycle crash involvement: A population based study.

Of the multiple self-reported outcomes analysed, statistically significant results were found for the number of near misses/close calls (Table 12), riding exposure (Table 18), unrealistic confidence in riding skills (Tables 21-22), attribution of cause of crashes to riders (Tables 25-26), and speeding behaviours (Tables 39-40). That is, the VicRide group reported fewer near misses/close calls, more riding hours in an average week, more unrealistic confidence in riding skills, more attribution of cause of crashes to riders, and more speeding behaviours than control riders, after accounting for the effects of age, gender, and riding exposure.

No other statistically significant results were found with respect to self-reported outcomes. That is, VicRide made no difference to the following:

- Optimism bias on the likelihood of being involved in a crash in the next 12 months compared to other riders their age, gender and level of riding experience
- Crash attributions to drivers rather than riders
- Safety beliefs in riding
- Deviant beliefs in riding
- Riding motivations for convenience, pleasure, or speed
- Riding behaviours of errors, stunts performance, or protective gear use.

The adjusted relative ratio indicated that the VicRide group reported 9.5% fewer near misses/close calls than the control group at Interview-2. This result may genuinely reflect riders in the VicRide having fewer near misses/close calls. This may be attributed to improved skills to avoid crashes given one of the aims of VicRide program was to improve hazard perception skills. It is possible that the VicRide riders developed better skills to anticipate the road and traffic ahead, detect, recognise and react to traffic hazards more quickly and efficiently such that they were able to avoid possible crash situations and thus be less exposed to near miss/close calls. Other driver and rider training programs that focus on training hazard perception skills have been successful in improving hazard perception skills (Crick and McKenna 1992, Vidotto, Bastianelli et al. 2011), and VicRide may also have been successful in improving hazard perception skills.

However, if the statistically significantly fewer near misses/close calls in the VicRide group was an indication of improved hazard perception skills it did not lead to statistically significant crash reductions. That is, the results on near misses seem to be at odds with the results indicated by no statistically significant effects on crashes. Rider and driver training may be effective in improving hazard perception skills but the challenge lies in the translation of those skills to crash reductions. Even though hazard perception skills may be teachable and learnable via training as noted above, the weak link between higher order hazard perception skills and crash risks has been suggested (Sagberg and Bjørnskau 2006, Cheng, Ng et al. 2011, Beanland, Goode et al. 2013). The inconsistent results may also suggest a stronger statistical power to detect significance for near misses because near misses are more common events than crashes.

Alternatively, it is possible that riders in the VicRide group may have become less aware of having almost had a crash due to increased confidence in their riding skills compared to the control group. A belief that they have better riding skills may logically allow for a belief that they can control risks such as near misses and therefore a belief that they are having fewer near misses, as suggested by the link between greater confidence in their own actions to prevent risks and lower perceived susceptibility to those risks (Weinstein 1984). However, this is only one possibility and other causal sequences are also possible.

The possibility that the result is a reflection of demand characteristics where riders in the VicRide group believed they should have less near miss experiences because they completed the program (and believe they have better riding skills than others) may be dismissed because demand characteristics were not observed consistently with self-reported crashes.

It is not possible to determine which of all the above accounts best explains the results within the current study. Near misses are complex events and as to whether they perceive them may depend on rider's stage of riding development. Nevertheless this effect on near misses/close calls was short-term and no longer evident at Interview-3.

The VicRide participants did not differ from the control group in their assessments of the likelihood of being involved in a crash. It is possible that the insight training component of VicRide, which focused on calibrating participants' perceptions of their own skills and risks with objective reality rather than teaching them vehicle-handling and manoeuvring skills (Rowden and Watson 2008), was partly effective in that it did not increase optimism bias.

However, the statistically significantly greater unrealistic confidence in own riding skills in the VicRide group suggests that an aspect of insight training to address the overestimation of personal ability (Gregersen 1996, Senserrick and Swinburne 2001) may not have been successful. VicRide aimed to improve hazard perceptions skills and the present measure of unrealistic confidence in skills addressed mostly hazard perception skills (three out of the four items were in relation to hazard perception skills and one item on vehicle control skills); therefore, perceived improvement in hazard perception skills might not have been 'unrealistic confidence' in this context. Greater unrealistic confidence in hazard perception skills than for vehicle control and other general skills have been observed elsewhere (Horswill, Waylen et al. 2004) and this may have contributed to the statistically significant result. Greater overestimation of skills than optimism bias for crash risks has also been observed (Svenson, Fjschoff et al. 1985, DeJoy 1989) and this may explain the significant impact on the former but a non-significant impact on the latter. The present results may suggest that the insight training component of VicRide did not counteract unrealistic confidence in riding skills, possibly strengthened through the potentially realistic increase in hazard perception skills as a specific training component of VicRide.

While VicRide had a particular focus on improving hazard perception skills and deliberately limited focus on vehicle handling skills training, it appears to have resulted in greater confidence in riding skills by the VicRide riders. However, this study could not establish the relative role of confidence in vehicle handling skills versus hazard perception skills in risk taking and crash risks. It may be useful to further investigate the respective impact of confidence in vehicle handling skills versus hazard perception skills in risk taking and crash risks. This may also help improve the contents of a training program. While the present study did not show apparent road safety benefits of VicRide overall, future evaluation of other forms of

insight training may be considered via an RCT in relation to unrealistic confidence in vehicle handling skills and hazard perception skills separately, optimism bias for future crash risks, risk taking behaviours and crash outcomes. A small-scale RCT conducted in the Netherlands recently reported no increase in unrealistic confidence after a motorcycle training (Boele & Craen 2014). However, no details of the measure or the statistical analyses were provided to assess the quality of the results and the program was not evaluated on risk taking or crashes outcomes.

It is also important to acknowledge the possible limitation in the application of the measure of unrealistic confidence. Unrealistic confidence refers to a level of confidence over the population that is statistically impossible. For example, it cannot be the case that the vast majority of us are better than average at a particular skill. The current measure of unrealistic confidence was worded appropriately to capture this perception compared with peers. However, when a particular group (such as riders who have just undertaken VicRide) is asked the question, a finding that they believe they are on average better than average is not alone proof of 'unrealistic' confidence. Rather, it may be realistic for them to believe that they are better than average because of possibly increased skills obtained through the program.

However, the extent to which the VicRide participant's confidence in riding skills are matched with their actual riding skills cannot be known. That is, it cannot be known for certain their confidence after VicRide participation is unrealistic or not. Nonetheless, the level of confidence (unrealistic or not) increased from baseline after program participation. Hence, the potential problem that this greater confidence may lead to greater risk taking remains.

In this report we have continued to use the conventional term of unrealistic confidence to discuss the findings based on this measure for consistency and clarity of what measure we are referring to. It is not conducive to effective communication to change the name of the measure post-hoc to be different between the VicRide and control groups. Nonetheless, it is acknowledged that we have not demonstrated 'unrealistic' confidence for the VicRide group, only that the level of confidence (unrealistic or not) increased from baseline after program participation. Whether unrealistic or not, confidence may be related to risk taking. Future research may be of value to improve distinct measurement of realistic versus unrealistic confidence and their respective relationship to risk taking.

The VicRide group reported statistically significantly more speeding behaviours. A combination of greater confidence (unrealistic or not) in their riding skills and a possible lower perception of risks as indicated by fewer reporting of near misses/close calls may lead to greater risk taking behaviour of speeding. Links between low risk perception and greater risk taking behaviour (Brown and Groeger 1988) as well as between confidence and greater risk taking behaviour (Fuller 2005) have been observed among drivers. The evaluation of a rider program, BikeSafe Scotland, found that while riders reduced their speeds in built-up areas following the program, they also increased their speeds in rural areas, hypothesised to be due to an increased confidence in their skills,(Ormston, Dudleston et al., 2003).

The net outcome of the greater skills and greater confidence on crash risk will be determined by the relative strengths of these effects. The final outcome of the evaluation, that there is no statistically significant improvement or reduction in crash risks could be interpreted as suggesting that the effects of greater skills and greater confidence countered each other to produce no safety benefits overall. However, it is also possible that neither effect was of sufficient magnitude or relevance to effect safety.

No statistically significant differences in riding exposure between the control and VicRide groups were apparent at Interview-2. However, riding exposure was statistically significantly higher for the VicRide group than the control group at Interview-3. That is, the VicRide group reported riding more than the control group around 12 months after program completion. While increased riding per se is not a negative outcome, its combination with greater risk taking behaviours such as speeding put riders at a greater risk of being involved in a crash in the longer term future. This possibility presents as a major risk to roll out VicRide state-wide in future.

The Crash Attribution scale measured the extent to which motorcyclists attribute causes of crashes to driver errors (driver attribution) versus motorcyclist errors (motorcyclist attribution). The increased attribution of the cause of crashes to riders, yet the increased speeding behaviours by the VicRide riders may suggest that while VicRide may increase the awareness or acceptance of the risks of riders as opposed to drivers, this does not necessarily lead to reduced self-reported speeding. This again may suggest the lack of effectiveness of the insight training component of VicRide intended to help riders reflect on the rider behaviours that may lead to crashes.

However, the Crash Attribution scale items were not worded to measure the crash attribution to the rider him/herself responding to the questions, but riders and drivers in general. Increased unrealistic confidence in riding skills may suggest that VicRide riders believe they are better riders than other riders and they may be making the attribution of the cause of crashes to 'other' riders who they believe are worse riders than themselves. Other studies show similar observations where people may be aware that their peer group is at higher risk for crashes compared with others in general but still rate themselves as if they are not part of that group (Finn and Bragg 1986, Horswill, Waylen et al. 2004). This may also explain why VicRide riders are continuing to take risks themselves. VicRide riders may believe it is ok for them to be speeding because it is the 'other' less skilled riders that are responsible for crashes. However, the very low reliability of the rider attribution scale among the present novice rider population must be noted, and caution may be required in interpreting this result.

VicRide may have been successful in improving hazard perception skills (as indicated by statistically significantly fewer near misses than the control riders), but VicRide participants showed greater confidence in riding skills (including hazard perception skills) and more speeding than control riders. The driver and rider training literature (e.g. Katila, Keskinen et al. 1996, Katila, Keskinen et al. 2004, Beanland, Goode et al. 2013) as well as the present findings suggest that training has the tendency to increase confidence in driving/riding skills and thus may increase risk taking. Some forms of training with promising results to reduce unrealistic confidence have been suggested (Gregersen 1996, Perrissol, Smeding et al. 2011, White, Cunningham et al. 2011) but their effects on risk taking and crashes have not been examined concurrently. Nevertheless, the present study provided no evidence that VicRide delivers overall gains to rider safety.

4.3 Economic evaluation

The results on willingness to pay (WTP) for VicRide were presented in Section 3.6.1 and Tables 56-59. The WTP for VicRide was statistically significantly lower for the VicRide group than the control group, that is, riders who received the program were willing to pay a statistically significantly lower amount for the program compared to those who did not receive it.

The top three reasons for their WTP choice was 'That's how much the course is worth to me' (32.7%), 'I want to learn more riding skills and this is a good way to do it' (25.2%), and 'I value safety' (14.4%).

Respondents' certainty with their choice of WTP value was high with an average of 8.1 (SD=2.0) out of 10, and protest responses were overall minor (n=27; 1.3%). These suggest the WTP values obtained were reasonably reliable and riders seem to value the VicRide training less after participation.

Given no reductions were made in crashes a cost effectiveness analysis was not conducted..

4.4 Summary and implications

Whilst the coach and VicRide participant feedback on VicRide were generally positive, the program did not have an effect on crashes (self-reported or police-recorded), time to first police-recorded crash, or injury crashes. In fact, consistent with the previous driver training and rider training literature, increased confidence and speeding behaviour were evident in the present study.

Although the program was delivered as intended by the design on most aspects, those design features did not bring about reductions in crashes speeding, unrealistic confidence or optimism bias. The fact that almost 30% of the participants had not completed the preparation activity before the program participation may have negatively impacted the program outcomes. However, the low percentage completions of the preparation activity among the program participants and of the program itself among the VicRide group may also reflect that individualised programs such as VicRide are practically too difficult to standardise and implement as a state-wide intervention, at least when not mandatory.

VicRide was also designed in a way to contain all the promising features to reduce crash risks as suggested by the literature—focus on higher order cognitive skills such as hazard perception (Crick and McKenna 1992) and insight training (Senserrick and Swinburne 2001). If the statistically significantly fewer near misses/close calls in the VicRide group was an indication of improved hazard perception skills, it did not lead to statistically significant crash reductions. Further, this effect was short-term and was no longer evident at around 12 months after VicRide completion. Rider and driver training may be effective in improving various skills, but it has been extensively shown that improved vehicle handling skills do not lead to crash reductions for drivers (Gregersen 1995, Lynam and Twisk 1995, Katila, Keskinen et al. 1996, Katila, Keskinen et al. 2004), and the weak link between higher order hazard perception skills and crash risks has also been suggested (Sagberg and Bjørnskau 2006, Cheng, Ng et al. 2011, Beanland, Goode et al. 2013). Furthermore, increased confidence, increased speeding behaviour and no change in optimism bias after VicRide training may suggest the insight training component of VicRide was not effective overall.

Training as a mode of road safety intervention assumes that road safety is addressed with a focus on human factors. By improving the riders or drivers it is believed that road safety benefits are achieved. Research suggests the more drivers believe human factors to be important in crash causation, the greater unrealistic confidence in riding skills and optimism bias for future risks they show (DeJoy 1989). Training also offers learning to control the vehicle or the road situation and/or that a crash situation is controllable by the drivers/riders. Increased perceived control from training also leads to greater optimism bias and unrealistic confidence (DeJoy 1989). Increased or maintained optimism bias after training may

be inevitable because it is the nature of training to increase skills and therefore confidence. Development of training that delivers safety gains may therefore be extremely challenging.

The current study adopted a highly rigorous evaluation method to overcome many of the methodological limitations of previous evaluation studies of motorcycle riding training programs. These limitations included non-random assignment or self-selection, no control group, failure to control or measure confounding variables, lack of appropriate follow-up, and evaluation against a limited number of outcomes that had questionable reliability and validity (Kardamanidis, Martiniuk et al. 2010 , Beanland, Goode et al. 2013). The present study employed an RCT where the study participants were randomly allocated into the intervention (VicRide) or control groups and both groups were followed up and their outcomes compared. To further control for selection-bias analyses were conducted on an intention-to-treat basis. Participants were also compared and matched on a range of demographic and rider characteristics to ensure the randomisation was successful and effectively controlled for possible confounding factors between the VicRide and control groups. All analyses further controlled for the common crash risk factors of age, sex and riding exposure. This study achieved a large sample size of 2399 and involved a long follow-up period of 12 months as well as a shorter period of three months. The follow-up rates were extremely high at 89% at Interview-2 and 88% at Interview-3. The majority (90%) of the riders followed up were still riding and the follow-up rate accounting for those who stopped riding was still high at 79%. Even if only 60% of the VicRide group actually completed the program, the majority of the VicRide group were still successfully followed up to allow intention-to-treat analyses of the outcomes. Linkage to police reported crash and offence data also effectively means complete follow-up for these factors for the riders who were still riding at 12 months. The supplementary sensitivity analyses also supported the intention-to-treat analyses results. Composite crash outcomes of police-recorded and self-reported crashes were also used to maximise the statistical power to detect effects. Whilst not a perfect measure, police-recorded crashes are the best real world measure available in road safety and they were employed to assess the effectiveness of VicRide as well as self-reported crashes. Both police-recorded and self-reported crashes at two time-points were also assessed independently, all showing consistent results. The same results were also confirmed by examining time to first crash and self-reported injury crashes. The effectiveness was also assessed using a whole series of previously validated measures of risk taking behaviours, attitudes and motivations as well as police-recorded offences. Furthermore, this study recruited restricted licence holders not learner permit riders and therefore the outcomes are unlikely to have been affected by other motivations such as passing a licence test.

Despite the improvement in the evaluation methodology, the present results were consistent with the findings of previous evaluation studies of both driver and rider training—no evidence for crash reductions, but increased confidence and risk taking (speeding behaviour) were evident.

4.5 Limitations

The present evaluation did not involve direct tests of riding skills such as hazard perception tests, monitoring of actual riding via a simulator or naturalistic riding study. While more information to interpret the overall results would have been achieved, the present RCT was already quite a resource intensive study. Furthermore, riding performance in simulators may not be representative of participants' real-world riding due to both the limited duration and demand characteristics. A naturalistic riding study may be more representative of real-world riding but it is a costly and labour-intensive methodology.

Statistically significant reductions in near misses/close calls in the VicRide group could be a reflection of improved hazard perception skills. However, without concurrent and direct measure of near misses/close calls and hazard perception skills this can only be a speculation in the present study. Future studies on near misses and hazard perception and their link to crash involvement may be beneficial to further understand the role of hazard perception skills in crash involvement.

The rarity of police-recorded crashes and offences as well as the low program completion rates within the VicRide group may have influenced statistical power of the present analyses to detect effects. The composite crash rate was found lower than anticipated, at 11.6% on average. However, although not statistically significant, the effect size found was negligible, meaning a very large sample size would have been needed to demonstrate a significant effect. Further, we found participation in the program led to statistically significant increases in behaviours that are associated with increased crash risk, such as speeding, unrealistic confidence and increased riding time, so it is unlikely that even with a much larger sample size that any crash reduction would be present. The power was also maximised as noted above and the consistent results between various measures of crash outcomes (police-recorded, self-reported, independently and as composite outcomes, time to first crash, and injury crashes) as well as consistent results across many other studies (among various population groups, of different training types) and over a long time span of research on driver and rider training since the 1970s provide great confidence in the present results.

5 Conclusions

Despite the high quality evaluation methodology applied, the present results were consistent with the findings of previous evaluation studies of both driver and rider training—no evidence for crash reductions. VicRide may have been successful in improving hazard perception skills, but it was associated with an increase in confidence and in speeding behaviours with no reductions in crash risks. That is, there was no apparent evidence that VicRide delivers overall gains to rider safety.

6 Recommendations

Based on the results and evidence from the literature, recommendations are made with respect to issues requested by VicRoads (i.e. state-wide roll-out plan; changes in the program; ongoing evaluation plan).

Caution against particular practices

Recommendation 1: Given no detectable road safety value of VicRide and the numerous barriers to achieve high completion rates for both the preparation activity and program attendance, it is recommended a state-wide roll out of VicRide *not* be pursued as part of obtaining a rider licence or as a voluntary activity.

Recommendation 2: In light of inconsistencies between participants in terms of their compliance with preparation activities before VicRide attendance, it is recommended that if a revised program or any future programs are planned, then no similar pre-program activities should be required. All learning

opportunities should be contained within program attendance to maximise control of the delivery and ensure completion to cater for all levels of motivation.

Recommendation 3: Even if there may be a group of riders who are particularly interested in skills training given the risk of increasing unrealistic confidence in riding skills, and subsequently crash risk, it is recommended that future programs continue to have little/no focus on skills training until more evidence is available on the best method to improve skills without increasing confidence, which can lead to increased risk taking and therefore higher crash risk.

Knowledge gaps and future research

Recommendation 4: While VicRide had a particular focus on improving hazard perception skills and deliberately limited focus on vehicle handling skills training, it appears to have resulted in greater confidence in riding skills by the VicRide riders. However, this study could not establish the relative role of confidence in vehicle handling skills versus hazard perception skills in risk taking and crash risks. It is recommended that the respective impact of confidence in vehicle handling skills versus hazard perception skills in risk taking and crash risks be investigated in future research to help improve rider safety programs.

Recommendation 5: Given there remains no evidence for road safety benefits of motorcycle training programs, it is recommended that any future proposed training programs only be implemented in the context of a trial design such as an RCT in relation to the outcomes of unrealistic confidence in vehicle handling skills and hazard perception skills separately, optimism bias for future crash risks, risk taking behaviours and crash outcomes.

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8 List of Appendices

1. Literature Review report to VicRoads

2.1 Baseline survey

2.2 Participant characteristics at baseline

3.1 Interview-2 survey (including VicRide participant feedback survey and CV survey)

3.2 Participant characteristics at Interview-2

4.2 Interview-3 survey

4.3 Participant characteristics at Interview-3

5. Coach survey

6. HART program delivery data – key variables specified for the evaluation

7. Coding methodology

8. Sensitivity analyses results

9. Discrepancies between HART data and VicRide participant feedback

10. Paper publications (including Chika's PhD papers)