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Reduction Of Road Related Optimism Bias and Risk Taking: Final Report

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Abstract

Optimism bias regarding road-related optimism bias may contribute to road deaths and injuries by increasing risk-taking on the road. Because driver training courses may worsen road-related optimism bias, components of driver training courses which seek to reduce this bias are important. Although optimism bias is difficult to reduce, techniques developed and evaluated during this research program appear to have some promise. Further, a session of a driver training program (the "Low Risk Driving Course") designed to combat optimism bias appears to have comparable efficacy. These approaches share two important components: teaching drivers to have a realistic view of their past experience, and motivating them to think realistically in order to minimize their crash risk. Further research is required to promote a better understanding of road-related optimism bias and to refine techniques which reduce it.

Keywords

Risk perception

Road safety intervention

Driver training

Optimism bias

NOTES:
(1) This report is disseminated in the interests of information exchange.
(2) The views expressed are those of the authors and do not necessarily represent those of the Commonwealth.

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3 EXECUTIVE SUMMARY

3.1 BACKGROUND

1. Road trauma is a major cause of fatality and young drivers are over-represented in road trauma statistics.
2. On-road risk-taking increases the frequency and severity of road accidents and on-road risk-taking may be greater amongst younger drivers.
3. Risk-taking may be influenced by perceived risk-utility and perceived risk.
4. Optimism bias regarding road-related events (i.e. the belief that negative road-related events are less likely, and positive road-related events more likely, to happen to oneself than to one's peers) may contribute to risk-taking on the road, but evidence for the relationship between optimism bias and risk-taking appears to be complex.
5. Driver training may worsen road-related optimism bias, and this may account for the ineffectiveness of driver training as a road safety countermeasure.
6. The Corporate Driver Training Australia Ltd. (CDTA) "Low Risk Driving Course" includes a session designed to combat road-related optimism bias, which we aim to evaluate and refine in the present research program.
7. People may be optimistically biased about their past, and this may be one cause of future-related optimism bias which could be targeted in interventions designed to reduce optimism bias.

3.2 STUDY 1: INVESTIGATION OF ROAD-RELATED OPTIMISM BIAS IN A TERTIARY STUDENT SAMPLE

1. Study 1 demonstrated future- and past-related optimism bias regarding road-related (and road-unrelated) events amongst licensed 18-24 year old Psychology I students.
2. Road-related optimism bias was stronger than road-unrelated optimism bias.
3. Past-related optimism bias correlated positively with future-related optimism bias, so may contribute to it. Safe driving experience was also significantly associated with optimism bias.
4. Subjects reported being fairly safe drivers. Self-reported on-road risk-taking was significantly positively associated with a tendency to conform to social expectations.
5. Optimism bias regarding the future and the past was mostly negatively associated with on-road risk taking and involvement in road (and other) trauma, suggesting that risk-taking and experience influence optimism bias (rather than vice versa).
6. There was some evidence that optimism bias promotes on-road risk-taking and involvement in road (and other) trauma.
7. On-road risk-taking was consistently related to involvement in road (and other) trauma, suggesting that if road-related optimism bias promotes on-road risk-taking, reducing road-related optimism bias would benefit road safety.

3.3 STUDY 2: DEVELOPMENT OF AN INTERVENTION DESIGNED TO REDUCE ROAD-RELATED OPTIMISM BIAS IN A TERTIARY STUDENT SAMPLE

1. Instructions designed to reduce past- and future-related optimism bias regarding road-related events were somewhat effective, amongst licensed 18-24 year old Psychology I students.
2. Instructions designed to reduce future-related optimism bias reduced future-related optimism bias (relative to controls) for some events, and even eliminated future-related optimism bias for some of these.
3. Instructions designed to reduce past-related optimism bias reduced past-related optimism bias (relative to controls) for some events, and even eliminated past-related optimism bias for some of these. These instructions also reduced future-related optimism bias (relative to controls), and even eliminated future-related optimism bias for some of these.
4. Although they were focussed on road-related optimism bias, the instructions also reduced (and in some cases, eliminated) road-unrelated optimism bias, so may have health benefits beyond reducing road trauma.

3.4 STUDY 3: EVALUATION OF INTERVENTIONS DESIGNED TO REDUCE ROAD-RELATED OPTIMISM BIAS IN A CORPORATE DRIVER TRAINING SAMPLE

1. The CDTA intervention reduced future- and past-related optimism bias (relative to controls) for some events, and even eliminated optimism bias for some of these.
2. The USYD intervention, based on the instructions designed to reduce future-related optimism bias in Study 2, but incorporating messages designed to reduce past-related optimism bias, and more explicit techniques for reducing future-related optimism bias, were about as effective as the CDTA intervention.
3. The reductions in optimism bias wrought by the CDTA intervention persisted for at least 2 years (as assessed amongst subjects participating in a course to "refresh" the CDTA course in which they had participated approximately 2 years before the present research program).
4. Various Study 1 findings were replicated in the driver training sample:
   a) Future- and past-related optimism bias regarding road-related (and road-unrelated) events were observed.
   b) Road-related optimism bias was stronger than road-unrelated optimism bias.
   c) Past-related optimism bias correlated positively with future-related optimism bias, so may contribute to it. Safe driving experience was also significantly associated with optimism bias.
   d) Subjects reported being fairly safe drivers. Self-reported on-road risk-taking was significantly positively associated with a tendency to conform to social expectations.
   e) Optimism bias regarding the future and the past was mostly negatively associated with on-road risk taking and involvement in road (and other) trauma, suggesting that risk-taking and experience influence optimism bias (rather than vice versa).
   f) On-road risk-taking was consistently related to involvement in road (and other) trauma, suggesting the importance of reducing road-related optimism bias and thus on-road risk-taking.

3.5 RECOMMENDATIONS

1. Interventions that reduce optimism bias should be harnessed as a means of promoting road safety.
2. It is particularly critical that interventions which reduce optimism bias be incorporated in driver training programs, and this need should be promoted.
3. The interventions described in the present report should thus form the basis of interventions employed in future to combat road-related optimism bias.
4. Several features of the present interventions should be included in future interventions:
   a) Techniques which reduce past-related optimism bias (e.g. by identifying it) are likely to be important in reducing future-related optimism bias.
   b) Further techniques for reducing future-related optimism bias should be based on well-supported theories of optimism bias, and must be offered in clear and explicit terms.
   c) The intervention must incorporate messages designed to motivate the target audience to reduce their optimism bias. For example, participants may be given the message that optimism bias could be harmful to their health because it may promote risk-taking.
5. The present interventions are already suitable for practical application, but require additional evaluation and refinement may further improve their efficacy.

4 BACKGROUND AND FOCUSSED LITERATURE REVIEW

4.1 INTRODUCTION

Road trauma is a major cause of fatality and injury in developed nations [see Figure 1], especially amongst young people (Hatfield & Job, 1996; Lee, Prabhakar & Job, 1993, 1996; Prabhakar, Lee & Job, 1996) [see Figure 2]. Thus, not only are many lives lost, but because so many victims are young, accidental injury causes more loss of life years than even the largest killers (cancer and heart disease)(Kaplan, Sallis, & Petterson, 1993).

The frequency of road trauma is increased by risk-taking on the road (Wasielewski, 1984; Evans & Wasielewski, 1982), and accident severity may also be increased by risk-taking (e.g. not wearing a seatbelt, impact of higher speeds). Further, the overrepresentation of young road users in crash statistics may be due at least in part to their tendency to take risks (for reviews see Hatfield & Job, 1996; Jonah, 1986; see also Lee, Prabhakar, & Job, 1993, 1996; Prabhakar, Lee, & Job, 1996). Thus, road safety, especially for young drivers, would profit from effective reduction of risk-taking.

Risk-taking behaviour may be promoted by failure to perceive risk accurately, or by placing a positive value on taking the risk (risk utility; see Jonah, 1986). The present report considers the role of risk perception.

It is proposed that risk-taking on the road is increased by "optimism bias" regarding involvement in road trauma. Thus, reduction of such optimism bias could reduce risky driving and road trauma involvement.

4.2 OPTIMISM BIAS

"Optimism bias" refers individuals' common belief that unpleasant events are less likely, and pleasant events more likely, to happen to them than to their peers (for review see Weinstein, 1989a). For

example, people believe they are less likely to have a heart attack, or to have their wallet stolen, and more likely to live past 80, or to own their home, than the average person of their age and gender (Weinstein, 1980).

Optimism bias has been demonstrated in relation to many aspects of road use. For example, people believe that, compared to their average peer, they are less likely to be involved in a car accident (Finn & Bragg, 1986; Matthews & Moran, 1986), less likely to be injured or killed in a car accident as a driver, and less likely to be or booked for speeding (and other offences) (Job, Hamer, & Walker, 1995; see also DeJoy, 1989). People also believe that they are better and safer drivers than their peers (Job, 1990; Job et al., 1995; Svenson, Fishhoff & MacGregor, 1985), and that they run red lights less frequently (Morgan & Job, 1995).

4.3 OPTIMISM BIAS AND RISK-TAKING

Road-related optimism bias may promote risk-taking on the road. Optimism bias is hypothesised to promote risk-taking and inhibit precaution-taking (Weinstein, 1988, 1989a, 1989b, 1993). According to a number of leading theories of health behaviour, (see: Janz & Becker, 1984; Weinstein, 1988), perceived personal risk is a primary determinant of risk-taking. Further, perceived relative risk has been shown to influence behaviour to at least as great an extent as perceived personal risk (Klein, 1997; in relation to road safety in particular: see Morgan & Job, 1995).

The overview of studies which have investigated the relationship between relative risk estimates and precaution-taking (actual behaviour, as well as intentions) presented in Table 1 reveals that evidence pertaining to this issue is inconclusive (for reviews see Hoorens, 1994; Taylor & Brown, 1988; Weinstein, 1989b; Weinstein et al., 1990). Nonetheless, this inconsistency may be accounted for by various theoretical and methodological considerations.

First, the impact of optimism bias on precaution-taking may depend on the mechanism which produces it. For example, if optimism bias results from egocentric consideration of one's own risk decreasing behaviours (and failure to consider others'), then it should be associated with precaution-taking rather than lack of it. If, however, it is produced by defensive denial, such that one does not accept that one is at risk, optimism may be associated with lack of precaution-taking. Of course, in reality a complex interaction of these processes may occur. Thus, the possibility that current precaution-taking influences optimism bias (via egocentrism) does not preclude the possibility that optimism bias in turn influences precaution-taking.

Second, the direction and strength of the relationship between risk perception and precaution-taking may depend on the stage of precaution adoption referred to (Weinstein & Nicolich, 1993). Past and current precaution-taking may contribute to optimism bias (as predicted by the egocentrism account) and may reduce perceived personal risk. Thus, past and current failure to take precautions may increase perceived relative and absolute risk. Behavioural intentions may also influence risk perception. In turn, current risk perception (relative and personal) may influence intention to take precautions and thus future precaution-taking. The time for which a precaution is known to be available is likely to influence the relationship between risk perception and behaviour (Weinstein & Nicolich, 1993). Of course, past and current precaution-taking are also likely to be good predictors of future precaution-taking.

Third, given the complex range of variables which influence precaution-taking (for example, see Smith Klohn & Rogers, 1991; Weinstein, 1988), the influence of optimism bias may go undetected.

Finally, measurement error may contribute to apparent inconsistency in the relationship between optimism bias and precaution-taking. Optimism bias is assessed employing questionnaires, and measurement of precaution-taking often also relies on self-report. Self-report measures may not be

perfectly reliable. Lack of reliability in the measurement of two variables reduces the possibility of detecting a consistent relationship between them.

The majority of longitudinal studies suggest a negative relationship between optimism bias and safe behaviour (or behavioural intention).

Table 1: An overview of prospective or cross-sectional studies with results consistent with the hypothesis that optimism bias inhibits safe behaviour (precaution-taking or lack of risk-taking), that safe behaviour promotes optimism bias, or that optimism bias and safe behaviour are unrelated.

Negative relationship	*No relationship*	*Positive relationship*
Prospective studies	*Prospective studies*	*Prospective studies*
Weinstein et al., 1990	Joseph et al., 1987	van der Velde et al., 1991
Blalock et al., 1990	Aspinwall et al., 1991	van der Velde et al., 1992
Klein, 1997		van der Velde et al., 1994
Davidson & Prkachin, 1997		
Cross-sectional studies	*Cross-sectional studies*	*Cross-sectional studies*
Larwood, 1978	Robertson, 1977	Svenson et al., 1985, Studies 1 & 2
Svenson, 1981	Svenson et al., 1985, Study 2	Weinstein et al., 1986
Weinstein, 1982	Gladis et al., 1992	Hoorens & Buunk, 1991
Spolander, 1983[a]	Langley & Williams, 1992	Renner, 1993[b]
Svenson et al., 1985, Study 1		
Dolinksi et al., 1986		
Hoorens & Buunk, 1993		

a Cited in Svenson et al. (1985)
b Cited in Schwarzer (1994)

Optimism bias regarding aspects of road use is negatively associated with self-reported adoption of precautionary behaviours (e.g. seat-belt use: Job et al., 1995) and optimism bias regarding the frequency of running red lights is significantly positively associated with preparedness to do so (Morgan & Job, 1995). Spolander (1982) found that drivers who rated their skills most highly compared to average report driving faster and passing other vehicles more often. These data are consistent with the view that optimism bias promoted risky behaviour (or undermines safe behaviour), however the data are observational and experimental designs are required in order to firmly establish causal direction.

Such experimental data are available. Klein (1997) manipulated perceived relative risk, and found subjects with lower perceived relative risk of "causing an automobile accident" were more likely to intend to drive more slowly, take public transport more often, and wear a seatbelt more often.

Thus, reduction of optimism bias could be of substantial benefit in reducing risk-taking on the roads and involvement in road trauma.

4.4 OPTIMISM BIAS AND YOUNG PEOPLE

Optimism bias regarding road safety may be exaggerated in young people. For example, younger people are more likely to demonstrate optimism bias regarding the likelihood of crash involvement (Finn & Bragg, 1986; Matthews & Moran, 1986), overall driving ability, vehicle handling skills and driving judgement (Matthews & Moran, 1986). Nonetheless, most evidence suggests that compared to older drivers (rather than compared to their average peer) young drivers perceive themselves to be equally or more likely to be involved in a car accident (Berger & Persinger, 1980; Bragg & Finn, 1986; Jonah & Dawson, 1982; Matthews and Moran, 1986). If exaggerated amongst young people, optimism bias may contribute to the over-involvement of young drivers in road trauma.

Several further factors related to risk perception may contribute to the overrepresentation of young drivers in crash statistics. Young people are generally less aware of road safety issues that are older drivers. For example, they are less likely to know that traffic accidents are the major cause of accidents among young adults, or that speeding is a major cause of accidents (Jonah & Dawson, 1982; see also Brown & Copeman, 1975; Finn & Bragg, 1986). However, Finn & Bragg (1986) observed no age effect on the perceived seriousness of drink driving (see also Wilson, 1984). Quimby and Watts (1981) demonstrated in a simulator study that younger people are slower to recognise potential hazards, despite faster simple reaction times. In-car studies suggest that younger drivers are equally likely to detect proximal hazards, but less likely to detect distant ones (Brown, 1972; Soliday & Allen, 1972).

It has been suggested that risky driving has several utilities to young people in particular (see Jonah, 1986; Lee et al., 1993).

4.5 OPTIMISM BIAS AND DRIVER TRAINING

Optimism bias is particularly concerning in the context of driver training and may partially account for the notorious ineffectiveness of advanced driver courses as safety countermeasures (for reviews see Horneman, 1993; Job, 1993, 1995). Increases in perceived skill as a result of driver training may increase confidence and optimism bias (Gregersen 1996a, 1996b; Job 1993) incommensurably with increases in actual skill. Further, experience of successful driving (which is often defined simply as crash free, or even fatal crash free, despite many errors) may be one source of road-related optimism bias (Job, 1990), consistent with extensive evidence of the relationship between experience and optimism bias (Weinstein, 1989a). Thus, experience of avoiding crash or injury during the risky situations to which driver training courses often expose their participants (e.g. speed, skid etc.), is likely to increase optimism bias. Optimism bias correlates positively with perceived control (see Harris, 1996), and so the increases in perceived control that are likely to result from driver training are likely to be accompanied by increases in optimism bias. Further, the information often conveyed in driver training courses (e.g. population crash rates, driver error) may promote optimism bias (see Job, 1990).

Despite the apparently limited efficacy of driver training as a safety countermeasure, extensive resources have flowed, and will continue to flow, into driver training. Thus, rather than abandonment of such training, refinement and evaluation of available training courses is should be undertaken (see Job, 1995). Given the possibility that a major part of the problem with driver training lies in overconfidence and biased risk perception, and given the promising evaluations of measures which address risk perception (Gregersen, 1996b), we aim to refine and evaluate components of an existing program which address optimism bias.

4.6 THE "LOW RISK DRIVING COURSE"

A "low risk driving course" developed by Corporate Driver Training Australia Pty. Ltd. was selected because it already incorporates techniques designed to reduce optimism bias and promote realistic risk assessment. The program describes unrealistic optimism, has participants evaluate their own thinking styles, identifies the importance of avoiding unrealistic optimism in terms of its impact on risk-taking and crash-involvement, and teaches strategies for developing a realistic thinking style.

Currently, the immediate and longer-term effects of the program on optimism bias itself are not known. However, if these techniques are effective in the long term the program may contribute to substantial reduction in risk-taking on the roads, and in road trauma involvement, amongst those choosing to take such a course. Thus, formal evaluation is warranted.

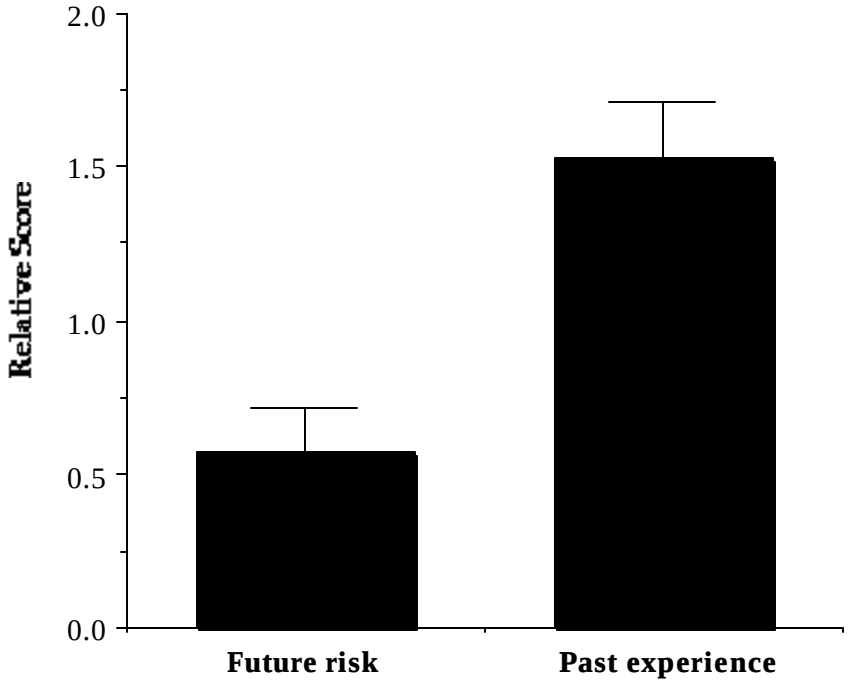
4.7 TECHNIQUES TO REDUCE OPTIMISM BIAS AND PAST-RELATED OPTIMISM BIAS

In order to reduce optimism bias it is necessary to understand its causes. Several theories of optimism bias have been supported, and it appears that optimism bias may be produced by different causes for different events (Chua & Job, 1999).

Optimism bias has proven to be very difficult to reduce (for example: Griffeth & Rogers, 1976; Hoorens & Buunk, 1992; Mahatane & Johnson, 1989; Regan, Snyder, & Kassin, 1995; Schoenbach, 1987; Siero, Kok, & Pruyn, 1984; Sutton & Eiser, 1990; Weinstein & Klein, 1995; Weinstein et al., 1991; Wurtele & Maddux, 1987). However, optimism bias has been reduced by interventions based on the egocentrism account (Weinstein, 1980; Weinstein & Lachendro, 1982), according to which people underestimate their relative invulnerability because they consider their own precautionary behaviour but not those of others when making risk estimates.

Such interventions, then, are a sensible starting point in developing programs to reduce optimism bias. Nonetheless, interventions based on other accounts may be effective for some events, and the cause of optimism bias for a particular event must be considered when attempting to reduce optimism bias in relation to that event.

Figure 3: Comparative size of future- and past-related optimism bias regarding negative events, where a score of 0 would indicate no optimism bias.



We recently discovered that people demonstrate "optimism bias" regarding their past, which tends to be even greater than the typical optimism bias regarding the future (Hatfield & Job, in press, see Figure 3). That is, people think that they have less prior experience of negative events than has their average peer. Our results also suggest that optimism bias regarding the past may be a critical determinant of optimism bias regarding the future. Peoples' belief that they have had a better past than their average peer may contribute to a belief that they will have a relatively better future. Indeed, prediction of the future derives more from past experience than a range of other factors including circumstances, personal dispositions, and population base rates (Osberg & Shrauger, 1986). People distort their memory of past behaviour patterns in order to maintain a perceived superiority over their peers (Klein & Kunda, 1993; see also Klein, 1996), and optimism bias regarding the past correlates positively with optimism bias regarding the future (Hatfield & Job, in preparation).

The possible causal role of past-related optimism bias appears to be particularly relevant to road safety. Unlike many other risks (cancer, heart attack, stroke, etc.) there is no apparent genetic basis for crash involvement. Participants do have substantial experience as drivers and passengers. Thus, perceptions relating to their experience are likely to contribute strongly to their judgements of risk.

Thus, programs aimed to reduce road-related optimism bias may benefit from consideration of biased perception of past experience on the road as well as biased perception of the future.

5 OBJECTIVES

The research program reported here aimed to develop and evaluate components of driver training which reduces road-related optimism bias, and thus risk-taking on the roads. Specific aspects of road-related optimism bias, and their impact on risk-taking on the roads, were investigated. An

existing program was compared to a refined program, which included a manipulation to reduce past-related optimism bias.

These objectives were served by the following subsidiary aims:

1. To identify optimism bias regarding various aspects of future road use.
2. To identify optimism bias regarding various aspects of past road use.
3. To evaluate the hypothesis that optimism bias regarding the past contributes to optimism bias regarding the future, in the context of road use.
4. To evaluate the extent to which optimism bias regarding the future versus the past promotes risk-taking on the road (and thus road trauma).
5. To evaluate the extent to which optimism bias regarding the future versus perceived personal risk influences risk-taking on the road (and thus road trauma).
6. To evaluate the extent to which risk-taking on the road contributes to road trauma involvement.
7. To develop, refine and evaluate techniques for reducing optimism bias regarding aspects of past road use, in order to employ these techniques in aims 8 & 9 below.
8. To evaluate the efficacy of an existing and promising road safety education program (the Low Risk Driving Course) which targets optimism bias regarding aspects of future road use, in reducing the bias, and risk-taking on the road, and road trauma.
9. To refine an existing road safety education program (the Low Risk Driving Course), specifically by including the addition of techniques to reduce optimism bias regarding aspects of past road use (see 7).
10. To evaluate the efficacy of the refined road safety education program (the Low Risk Driving Course) in reducing optimism bias regarding aspects of past and future road use, and their impact on perceptions of risk-taking on the road, actual risk-taking on the road and road trauma.

6 STUDY 1: INVESTIGATION OF ROAD-RELATED OPTIMISM BIAS IN A TERTIARY STUDENT SAMPLE

In Study 1, optimism bias regarding future road use, optimism bias regarding past road use, self-reported risk-taking on the road, and self-reported road trauma were assessed employing Psychology I students at the University of Sydney. Cross-sectional interrelationships of future-related optimism bias, past-related optimism bias, risk-taking on the road, and experience of road trauma, were evaluated.

6.1 METHODS

6.1.1 Subjects And Sampling

83 Psychology I students at the University of Sydney volunteered to participate in a study on "beliefs about road use" for course credit. Subjects entered their names on a sign-up sheet that was posted on a notice board in the Department of Psychology in keeping with standard departmental recruiting methods. The sign-up sheet explicitly limited volunteers to licensed drivers between 18-24 years of age[1]. Participants must be licensed so that the questionnaires are relevant to them. Most Psychology

[1] The statement limiting participants to licensed drivers between 18-24 years of age was inadvertently omitted from the first sign-up sheet. Thus, in affected sessions, but also in others, some participants did not meet these requirements. Such participants were excluded from analysis.

I students are within the specified age range, and the limitation is applied in order to reduce extraneous variation in analyses. Further, the over-involvement of young drivers in road trauma makes them a particularly important group to target with road safety interventions (although the present research program is mainly concerned with participants of driver training programs, who are mostly older). The possibility of employing only females in order to reduce variance was not employed, because male versus female differences road-related attitudes and behaviours are worthy of consideration, and because males are more road accident prone than females (Job, 1999).

6.1.2 Materials

Optimism Bias Questionnaire; (see Appendix 1)

Subjects were presented with a list of negative and positive events [see Table 2] and asked to estimate the likelihood that each of the events would affect them in the future, as well as the likelihood that the same events would affect "the average person" of their age and gender. Subjects responded on a fully labeled 7-point Likert scale (1= "extremely unlikely", 2= "very unlikely", 3= "unlikely", 4= "neither likely nor unlikely", 5= "likely", 6= "very likely", 7= "extremely likely").

Subjects were then asked to estimate how often each of a second, similar, list of events [see Table 3] have affected themselves and "the average person" of their age and gender in the past. They were instructed “When you are asked how often a driving-related event has happened, please consider only the past year. If you have been driving for less than one year, please indicate how often the event has happened in the time you have been driving. For events which are not driving-related, please consider your whole life so far”.

All of the events paralleled events employed in the future-related optimism bias scale, but were rephrased in the past tense. Some of the events from the future-related optimism bias scale were inappropriate for use in relation to the past (e.g. “be killed in a crash), and were thus omitted from the past-related optimism bias scale. Subjects’ responses were open-ended, except for the item “Got very good overall marks in the end-of-year exams at school”, for which they were asked to provide an answer between 1 and 6 because there are 6 years of high school. The past-related optimism scale also provides information regarding subjects’ previous involvement in road trauma.

Both road-related (e.g. injured in an accident as a driver, be booked speeding) and road-unrelated (e.g. flu) events were included in the list in order to compare optimistic biases regarding different types of events. Positive events (e.g. travel to Europe) were included to minimize response biases. That is, in order to demonstrate optimism bias regarding negative and positive events, subjects must employ both sides of the response scale. The order of making self versus average peer ratings was not counterbalanced, because this factor has been found to have no effect in our previous research with Psychology I students.

Table 2: Road-related negative, road-related positive, road-unrelated negative and road-unrelated positive events about which subjects made future risk estimates in the Optimism Bias Questionnaire, in Study 1.

6.1.2.1 Event type	*Event wording*
Road-related negative	Be booked for speeding
	Have a crash, as a driver at fault
	Be injured in a crash, as a driver at fault
	Be killed in a crash, as a driver at fault
	Be booked for doing an illegal U-turn
	Be injured in a crash, as a driver not at fault
	Be killed in a crash, as a driver not at fault
	Be booked for running a red light
	Be injured in a crash, as a passenger
	Be killed in a crash, as a passenger
	Be booked for driving with a blood alcohol content over the legal limit
Road-related positive	Be able to stop quickly in an emergency while driving
	Have 3 consecutive years of crash-free driving
	Have 3 consecutive years without being booked
	Avoid a crash nearly caused by another driver
	Drive safely while tired
Road-unrelated negative	Have pneumonia
	Have the car you are driving stolen
	Have gastrointestinal illness
	Have your wallet stolen
Road-unrelated positive	Not be hospitalised in the next 5 years for illness or injury
	Travel overseas in the next 5 years
	Get very good marks at university
	Own your own home

Table 3: Road-related negative, road-related positive, road-unrelated negative and road-unrelated positive events about which subjects made past experience ratings in the Optimism Bias Questionnaire, in Study 1.

6.1.2.2 Event type	*Event wording*
Road-related negative	Booked for speeding
	Had a crash, as a driver at fault
	Injured in a crash, as a driver at fault
	Had a crash
	Been booked
	Booked for doing an illegal U-turn
	Injured in a crash, as a driver not at fault
	Booked for running a red light
	Injured in a crash, as a passenger
	Booked for driving with a blood alcohol content over the legal limit
Road-related positive	Been able to stop quickly in an emergency while driving
	Avoided a crash nearly caused by another driver
	Drove safely while tired
Road-unrelated negative	Been hospitalised for illness or injury
	Had pneumonia
	Had the car you were driving stolen
	Had gastrointestinal illness
	Had your wallet stolen
Road-unrelated positive	Traveled overseas
	Got very good overall marks in end-of year exams at school

On-road Risk-taking Questionnaire; (see Appendix 1)

Subjects were provided with a list of 13 road-risk-related behaviours, some risk-increasing and some risk-decreasing [see Table 4]. Subjects were asked to consider their driving over the preceding year and to identify the frequency with which they "do certain actions while driving" on a fully labeled 7-point Likert scale (0= "never", 1= "hardly ever", 2= "occasionally", 3= "quite often", 4= "frequently", 5= "nearly all the time", 6= "always").

Demographic and control variables questionnaire; (see Appendix 1)

A final questionnaire was employed in order to assess several factors which may influence the critical risk-perception and on-road risk-taking variables. For example, subjects were asked how long they had been licensed, how many hours they spend driving as a driver and as a passenger in the average week, and whether they own a car (or have permanent access to a car). They were asked how many crashes they had been in as a driver, and to provide further details of any crash-involvement (e.g. whether anyone was killed or injured, whether vehicles were towed, whether anyone was booked). Subjects also responded to several questions assessing demographic variables (including age, gender, and socioeconomic status). The questionnaire also incorporated The Marlowe-Crowne Social Desirability Scale, short form C (Reynolds, 1982).

Table 4: Risk-increasing and risk-decreasing behaviours for which subjects identified frequency of performance in the On-road Risk-taking Questionnaire, in Study 1.

6.1.2.2.1 Behaviour type	*Item*	*Behaviour*
Risk-increasing	1	Run a red light
	2	Keep driving even though you are very tired
	3	Do an illegal U-turn
	5	Change lanes without checking properly for vehicles in other lanes
	6	Drive with a blood alcohol content above the legal limit
	7	Drive while under the influence of illegal drugs that may impair your driving
	8	Drive while under the influence of legal drugs (besides alcohol) that may impair your driving
	9	Travel as a passenger of a driver with a blood alcohol content above the legal limit
	12	Turn right across a busy road even when there is a small chance of a collision
	13	Exceed the speed limit by no more than 15km/hr
Risk-decreasing	4	Stop driving if you want to talk on a hand-held mobile phone
	10	Wear a seatbelt
	11	Reduce your usual speed when it is raining

6.1.3 Procedure

Subjects completed the questionnaires individually in a quiet room in the Department of Psychology as part of a group of other subjects (to encourage the perception of anonymity: see Job & Bullen, 1987). The room was attended throughout by one experimenter.

According to a standard script, all participants were assured of their anonymity and asked to complete the set of questionnaires as accurately and honestly as possible.

All subjects completed the Optimism Bias Questionnaire prior to the On-road Risk-taking Questionnaire, so that consideration of risk-relevant behaviours could not influence risk estimates.

After completing and returning the questionnaires subjects were debriefed.

6.2 STATISTICAL ANALYSIS

The raw data were analysed with SPSS (Statistical Package for the Social Sciences). The Type I error rate for all analyses was set at .05.

First we assessed the characteristics of the sample, in terms of age, gender, driving exposure and tendency to conform to social expectations.

Relative scores were then calculated for each item of the Optimism Bias Questionnaire, by subtracting self from average peer ratings for negative events and average peer from self ratings for positive events. Thus, a higher score reflects a belief that one is better off than their peers. A road-related relative future likelihood negative index was computed by averaging relative estimates across all road-related negative events. A road-unrelated relative future likelihood negative index was

computed by averaging relative estimates across all road unrelated negative events. Three average indices were computed by averaging scores for parallel pairs of items considering accident involvement as a driver at fault versus as a driver not at fault versus as a passenger. Positive indices were also computed for road-related and road-unrelated events. Road-related and road-unrelated positive and negative indices were computed for relative experience estimates. Because there were no items regarding death as a driver at fault, as a driver not at fault, or as a passenger, only the three items regarding injury in each of these three capacities were considered in analysis.

Optimism bias was assessed by comparing relative index and event scores to the score representing no difference between self and peers (0) using a 1-tailed single sample t-test. A sample average which is significantly greater than 0 reflects optimism bias.

The relative sizes of future- versus past-related optimism bias were compared employing a 1-tailed repeated measures t-test. Based on previous findings past-related experience was expected to be greatest.

Similarly, a repeated measures t-test was employed to compare the relative sizes of optimism bias regarding road-related versus road-unrelated events. A non-directional hypothesis was made regarding this comparison.

The hypothesis that optimism bias regarding the past contributes to optimism bias regarding the future was assessed by evaluating the correlation of relative future likelihood indices and events with corresponding relative experience indices and events. Significant positive correlations would provide evidence consistent with the hypothesis.

A general on-road risk-taking index was computed by adding all items form the On-road Risk Taking Questionnaire which were phrased in negative terms, and subtracting those which were phrased in positive terms.

The relationship of optimism bias regarding future and past road use with risk-taking on the road was evaluated by assessing the correlation of relative future likelihood estimates and relative experience estimates with a general index of on-road risk-taking behaviour. Due to the inconsistency of previous findings, the hypothesis was tested two-tailed. The relationship of optimism bias regarding specific road-related events (e.g. being booked for speeding) with corresponding on-road risk-taking behaviours (e.g. speeding) was also assessed.

The relationship of optimism bias regarding future and past road use with involvement in road trauma was evaluated by assessing the correlation of relative future likelihood estimates with estimates of personal experience of road trauma from the Optimism Bias Questionnaire, as well as the crash involvement item from the Demographic and Control Variables Questionnaire. For relative past experience scores only the relationship with crash involvement was assessed (due to the mathematical dependence of the personal and relative experience scales). Again, two-tailed tests were employed.

The relative sizes of correlations with on-road risk-taking and involvement in road (and other) trauma of future- versus past-related optimism bias were compared employing a Fisher's z-test.

Correlations of personal future risk estimates with on-road risk-taking and with involvement in road (and other) trauma were also computed (predictions were nondirectional), and their size compared to the corresponding correlations for future-related optimism bias employing a Fisher's z-test.

The proposition that on-road risk-taking contributes to road trauma is evaluated by assessing the correlation between indices of on-road risk-taking and road-trauma involvement. Significant positive correlations would be consistent with the hypothesis.

Finally, we assessed the impact of demographic variables (e.g. age, gender), driving experience (e.g. number of years licensed, average hours spent driving per week) and social desirability on risk perception, on-road risk-taking and involvement in road (and other) trauma. Correlations were employed to assess the relationship between two continuous variables, whereas independent

samples t-tests were employed to assess the relationship of continuous variables with dichotomous variables (e.g. gender). All predictions were nondirectional, because relevant evidence in the literature is inconsistent, and so a conservative approach was taken.

6.3 RESULTS

6.3.1 Sample Characteristics

The sample was 80.7% female (reflecting the predominance of females enrolled in Psychology I at the University of Sydney). Subjects had a mean age of 19 years (s.d.=3), had held their licenses for a mean of 2.4 years (s.d.=2.6), and spent on average 5.4 hours per week driving as a driver (s.d.=5.4), and 4.2 hours as a passenger (s.d.=2.6). The mean score on a scale assessing tendency to conform to social expectations (with a possible total score of 13) was a moderate 5.37 (s.d.=2.59).

6.3.2 Optimism Bias Regarding Various Aspects Of Future Road Use

Figure 4 presents mean relative future risk scores for each index (with bars indicating the standard error of the mean, S.E.M. bars).

Relative future risk scores were significantly greater than zero for the road-related negative and positive indices (t_{82}=9.24, p<.001, t_{80}=7.23, p<.001, respectively), and for the road-unrelated negative and positive indices (t_{82}=3.50, p=.001, t_{81}=3.51, p=.001, respectively). Optimism bias was also demonstrated for crash involvement as a driver at fault (t_{82}=6.64, p<.001), as a driver not at fault (t_{82}=4.26, p<.001), and as a passenger (t_{82}=6.72, p<.001).

Relative future risk scores were significantly greater than zero for each of 11 road-related negative events (lowest significant t_{82}=2.89, p=.003), 4 of 5 road-related positive events (lowest significant t_{82}=2.04, p=.023), 3 of 4 road-unrelated negative events (lowest significant t_{82}=2.61, p=.006), and 2 of 4 road-unrelated positive events (lowest significant t_{82}=2.16, p=.017). No event demonstrated relative scores lower than zero.

Thus, there is convincing evidence of optimism bias regarding road-related, as well as road-unrelated, events in the present sample.

6.3.3 Optimism Bias Regarding Various Aspects Of Past Road Use

Figure 5 presents mean relative past experience scores for each index (with S.E.M. bars).

Relative past experience scores were significantly greater than zero for the road-related negative index (t_{72}=9.44, p<.001; positive index lower than zero and thus nonsignificant according to the 1-tailed test employed), and for the road-unrelated negative and positive indices (t_{73}=3.78, p<.001, t_{80}=2.79, p=.004, respectively). Past-related optimism bias was also demonstrated for crash involvement as a driver at fault (t_{80}=7.61, p<.001), as a driver not at fault (t_{81}=7.74, p<.001), and as a passenger (t_{73}=5.01, p<.001).

Relative past experience scores were significantly greater than zero for each of 10 road-related negative events (lowest significant t_{81}=4.72, p<.001), 1 of 3 road-related positive events (t_{73}=2.27, p=.013), 3 of 5 road-unrelated negative events (lowest significant t_{81}=3.64, p<.001), and 1 of 2 road-unrelated positive events (t_{81}=4.22, p<.001). Only one event (a road-related positive event) demonstrated relative scores lower than zero (and was thus nonsignificant according to the 1-tailed test employed).

Thus, there is convincing evidence of past-related optimism bias regarding road-related and road-unrelated optimism bias, in the present sample.

Figure 4: Mean relative future risk estimates for the road-unrelated negative, road-unrelated positive, road-related negative, and road-related positive indices, and the index regarding injury/death as a driver at fault, as a driver not at fault, and as a passenger, in Study 1.

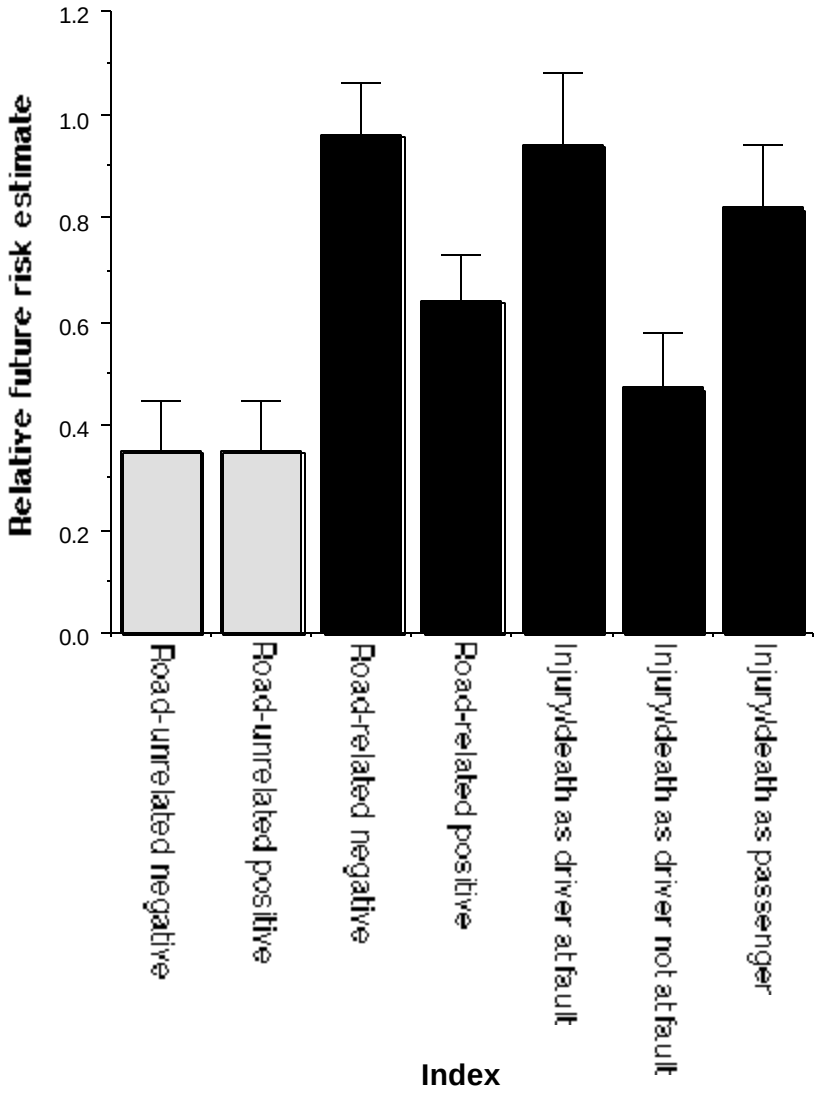
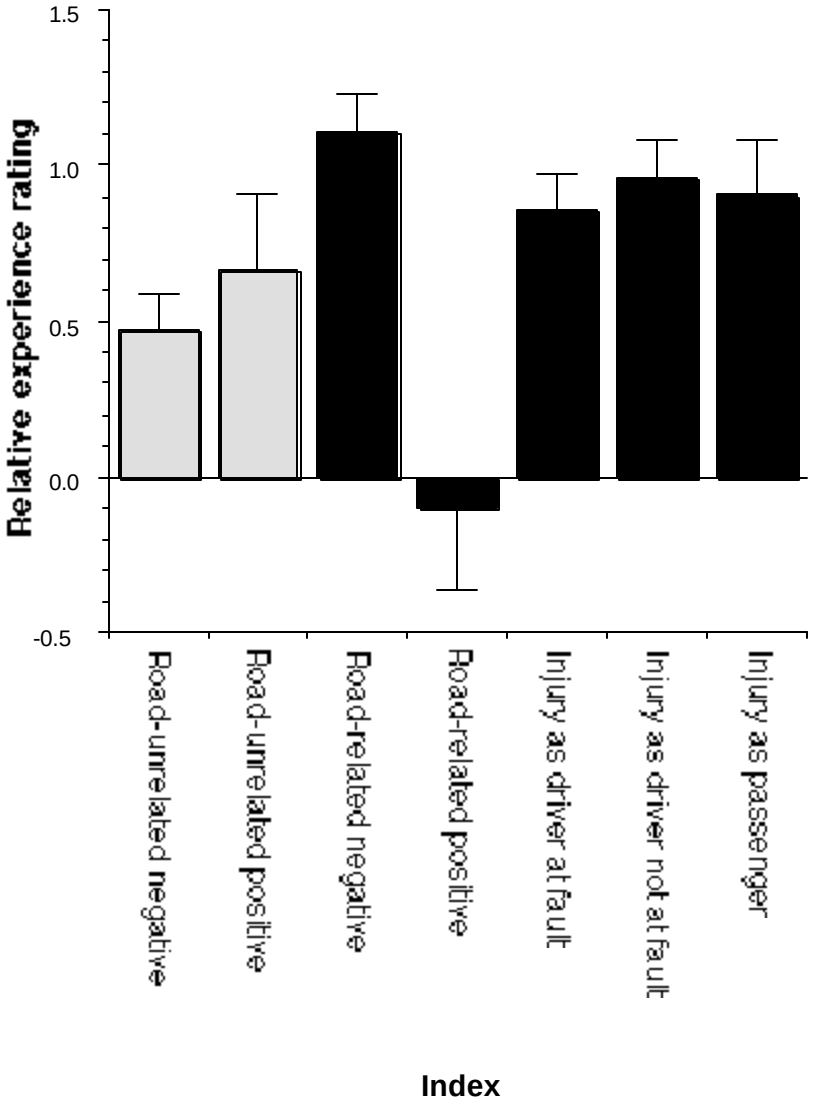


Figure 5: Mean relative past experience scores for the road-unrelated negative, road-unrelated positive road-related negative, and road-related positive indices, and the index regarding injury as a driver at fault, as a driver not at fault, and as a passenger, in Study 1.



6.3.4 Comparison Of Optimism Bias Regarding The Future Versus Optimism Bias Regarding The Past

As predicted, relative past experience scores were significantly greater than relative future risk scores for crash involvement as a driver not at fault (t_{81}=3.15, p=.001). Means were in the predicted direction for the road-related negative index, for the road-unrelated negative and positive indices, and for crash involvement as a passenger, but none reached significance (highest nonsignificant t_{79}=1.49, p=.070). For the remaining indices means were in a direction opposite to prediction, and thus did not differ significantly according to the 1-tailed test employed.

6.3.5 Comparison Of Road-Related Versus Road-Unrelated Optimism Bias, In Relation To The Future And The Past

Relative future risk scores were significantly greater for the road-related than for the road-unrelated indices (negative: $t_{82}=5.54$, $p<.001$; positive: $t_{79}=2.43$, $p=.017$) [see Figure 4].

Similarly, relative past experience scores were significantly greater for the road-related than for the road-unrelated negative index ($t_{72}=6.36$, $p<.001$). However, scores were significantly lower for the road-related than the road-unrelated positive index ($t_{72}=2.10$, $p=.039$) [see Figure 5].

6.3.6 The Relationship Of Optimism Bias Regarding The Past With Optimism Bias Regarding The Future

Table 5 presents correlations between corresponding relative future risk and relative past experience indices.

Table 5: Correlations between corresponding relative future risk and relative past experience indices (with n- and p-values), in Study 1.

	r	*n*	*p*
Road-related negative index	.248	73	.018*
Road-related positive index	.311	72	.004*
Road-unrelated negative index	.251	74	.016*
Road-unrelated positive index	.306	80	.003*
Crash as driver at fault	-.024	81	ns
Crash as driver not at fault	.118	82	.145
Crash as passenger	-.176	74	ns

ns= correlation in the direction opposite to prediction, and thus not significant according to the 1-tailed test employed.

Relative past experience scores demonstrated the predicted positive and significant correlations with relative future risk scores for the road-related negative and positive indices, and for the road-unrelated negative and positive indices. Past-related optimism bias was also significantly, positively correlated with future-related optimism bias for crash involvement as a driver not at fault, but not as a driver at fault, or as a passenger (correlations in the direction opposite to prediction).

Relative past experience scores were significantly positively correlated with relative future risk scores for 2 of the 10 road-related negative events (lowest significant r=.281, n=74, p=.008), and 2 of the 3 road-related positive events (lowest significant r=.298, n=72, p=.006), for which both experience and future risk were assessed. Similarly, relative past experience scores were significantly positively correlated with relative future risk scores for 2 of the 5 road-unrelated negative events (lowest significant r=.229, n=82, p=.019), and 2 of the 3 road-unrelated positive events (lowest significant r=.372, n=81, p=.001), for which both experience and future risk were assessed.

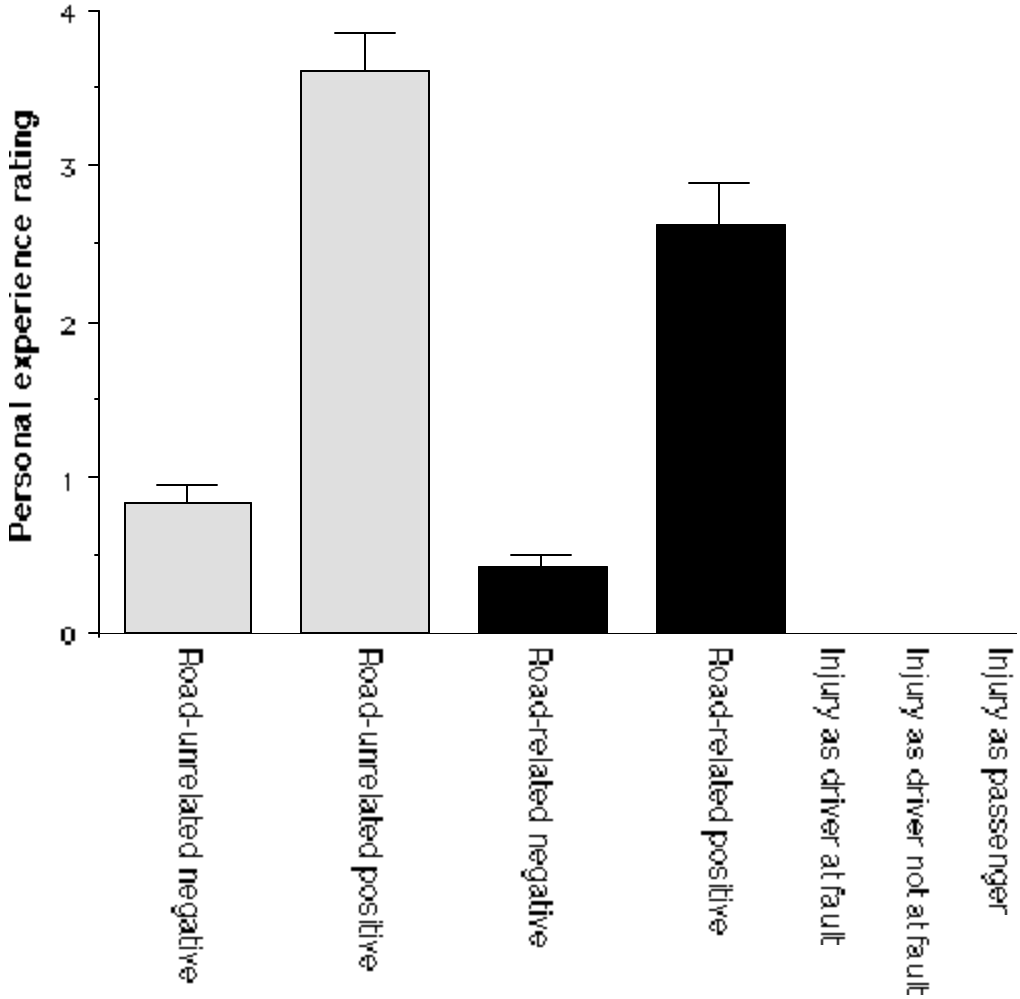
Thus, past- and future-related optimism bias was generally positively associated, which is consistent with the claim that past-related optimism bias contributes to future-related optimism bias (although other accounts of their association are possible).

6.3.7 Mean Self-Reported Risk-Taking On The Road And Self-Reported Involvement In Road (And Other) Trauma

On average, subjects reported "never" driving with a BAC above the legal limit, or driving under the influence of legal or illegal drugs which might impair their driving. They "frequently" reduce their usual speed when it is raining, and nearly always wear seatbelts. They reported "hardly ever" running red lights, changing lanes without checking, or travelling as the passenger of a driver with a BAC above the legal limit. They reported driving when tired, doing illegal U-turns, turning right when there is a small chance of collision, and exceeding the speed limit only "occasionally". On average, they "occasionally" stop to talk on their mobile phone.

Subjects had had 1 crash as a driver on average. Figure 6 presents mean ratings for the personal experience indices

Figure 6: Mean personal experience for the road-related negative, road-related positive, road-unrelated negative and road-unrelated positive indices, and the index regarding injury/death as a driver at fault, as a driver not at fault, and as a passenger, in Study 1.



Thus, subjects in the present sample, generally report being fairly safe drivers.

6.3.8 The Relationship Of Optimism Bias Regarding The Future With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

Table 6 presents correlations of the relative future risk indices with an average on-road risk-taking index, with corresponding personal experience indices, and with self-reported crash involvement (from the Demographic and Control Variables Questionnaire).

Table 6: Correlations of relative future risk with the on-road risk-taking index, corresponding personal past experience indices, and self-reported crash involvement (with n- and p-values), in Study 1.

	On-road risk-taking index	*Corresponding personal experience index*	*Crash involvement*
Road-related negative index	-.270 (79) .016*	-.076 (81) .500	-.196 (83) .076
Road-related positive index	-.031 (77) .792	.105 (80) .356	-.135 (81) .228
Road-unrelated negative index	-.092 (79) .421	-.168 (82) .131	-.089 (83) .425
Road-unrelated positive index	-.152 (78) .185	.109 (81) .331	-.001 (82) .993
Crash as driver at fault	-.098 (79) .392	.179 (81) .110	-.095 (83) .392
Crash as driver not at fault	-.045 (79) .694	.202 (82) .069	-.120 (83) .279
Crash as passenger	-.183 (79) .106	.371 (82) .001*	-.198 (83) .073

One significant negative correlation was observed between road-related optimism bias and on-road risk-taking. The remaining 6 correlations were each negative, suggesting that lower risk-taking is associated with optimism bias (including on the road).

One significant positive correlation was observed between optimism bias regarding negative road-related events and self-reported experience of corresponding events. Two of the remaining 4 correlations (with negative events) were positive and one demonstrated a low p-value (.069), suggesting that optimism bias is associated with greater personal experience of negative events. Both correlations with optimism bias regarding positive events were positive but not significant.

All correlations between relative future risk and self-reported crash involvement were negative but not significant.

Four relative future risk scores were negatively and significantly correlated with the on-road risk-taking index (lowest significant r=-.227, n=79, p=.044). Seventeen further correlations were negative but nonsignificant. Two significant positive correlations were also observed ("avoid crash

nearly caused by another driver": r=.268, n=79, p=.017; "drive safely while tired": p=.242, n=77, p=.034).

Relative future risk scores were significantly negatively correlated with personal experience scores for 5 of 16 negative events, suggesting that greater optimism bias is associated with lower personal experience of negative events. Significant positive correlations were observed for 3 of 4 positive events, suggesting that greater optimism bias is associated with greater personal experience of positive events. Only one negative event ("injured in a crash as a passenger") demonstrated a significant positive correlation between relative future risk and personal experience (as identified were it is treated as an index above).

Four relative future risk scores were negatively and significantly associated with self-reported crash involvement (lowest significant
r= -.222, n=83, p=.022). Fourteen further correlations were negative but nonsignificant.

Two further road-related relative future risk indices were computed by averaging scores for 4 events which involve crashing as a driver (4, 7, 8, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &16). Corresponding on-road risk-taking indices were computed by averaging scores for behaviours which are likely to contribute to having a crash as a driver (1, 2, 3, 4, 5, 6, 7, 8, 11, 12, & 13), and by averaging scores for behaviours which contribute to impairment (2, 6, 7, & 8). Finally, an average on-road risk-taking index was computed by averaging scores for behaviours which contribute to being booked (1, 3, 6, 10, & 13).

Correlations were then computed between the corresponding road-related relative future risk and on-road risk-taking indices, and between the relative future likelihood of having 3 consecutive years of not being booked and the average index of behaviours which contribute to the likelihood of being booked. We also computed correlations of the relative future risk scores for being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The correlations of self-reported frequency of driving when tired with the relative future likelihood of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with the relative future risk of crash involvement as a passenger, were also computed. These "focussed" correlations are presented in Table 7.

Table 7: Correlations of specific road-related relative future risk indices and events, with self-reported frequency of performing corresponding on-road risk-taking behaviours (with n- and p-values), in Study 1.

	r	*n*	*p*
Crash involvement as a driver index	-.187	79	.098
Impairment index	.159	82	.154
3 consecutive years without being booked	-.318	83	.003*
Booked for speeding	-.015	83	.896
Booked for doing an illegal U-turn	-.204	83	.064
Booked for running a red light	-.309	83	.004*
Booked for driving with a BAC over the legal limit	-.331	83	.002*
Driving safely while tired	.303	80	.006*
Crash involvement as a passenger	.025	83	.824

Significant correlations were observed suggesting that the more often individuals report performing illegal behaviours, the less optimistically biased they are regarding the likelihood of having three consecutive years in which they are not booked, the likelihood of being booked for running a

red light, or the likelihood of being booked for driving with a BAC over the legal limit. In contrast, the more optimistically biased individuals are regarding their ability to drive safely while tired, the more frequently they report continuing to drive even when very tired.

Thus, most observed relationships were consistent with the claim that risk-taking and trauma involvement influence optimism bias, although there was some evidence for the view that optimism bias promotes risk-taking and trauma involvement.

6.3.9 The Relationship Of Optimism Bias Regarding The Past With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

Table 8 presents correlations of the relative past experience indices, with the average on-road risk-taking index and self-reported crash involvement (from the Demographic and Control Variables Questionnaire). Correlations between relative past experience indices and corresponding personal experience indices were not considered because of the mathematical dependence of these scales.

Table 8: Correlations of relative past experience with the on-road risk-taking index and self-reported crash involvement (with n- and p-values), in Study 1.

	On-road risk-taking index	*Crash involvement*
Road-related negative index	-.137	-.276
	(71)	(73)
	.253	.018*
Road-related positive index	.177	-.021
	(72)	(74)
	.136	.857
Road-unrelated negative index	-.146	-.067
	(72)	(74)
	.222	.570
Road-unrelated positive index	-.088	-.088
	(78)	(81)
	.442	.437
Crash as driver at fault	.053	-.027
	(78)	(81)
	.647	.808
Crash as driver not at fault	-.093	-.036
	(79)	(82)
	.415	.748
Crash as passenger	-.218	-.123
	(72)	(74)
	.065	.295

No significant correlation was observed between past-related optimism bias and on-road risk-taking. Five correlations were negative (3 for road-related indices), suggesting that a low level of on-road risk-taking is associated with high past-related optimism bias.

A significant negative correlation of past-related optimism bias regarding road-related negative events and road trauma involvement was observed. The remaining correlations (for road-related and

road-unrelated indices) were also negative, suggesting that a low level of self-reported crash involvement is associated with a high level of past-related optimism bias.

Four relative experience scores were negatively and significantly correlated with the on-road risk-taking index (lowest significant r=.227, n=78, p=.046). Thirteen further correlations were negative but nonsignificant.

Four relative experience scores were negatively and significantly correlated with self-reported crash involvement (lowest significant r=-.230, n=82, p=.038). Twelve further correlations were negative but nonsignificant.

Two further road-related relative past experience indices were computed by averaging scores for 3 events which involve crashing as a driver (4, 7, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &14).

Correlations were then computed between the corresponding road-related relative past experience and on-road risk-taking indices, and between the relative past experience of having 3 consecutive years of not being booked and the average index of behaviours which contribute to the likelihood of being booked. We also computed correlations of the relative past experience of being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The correlations of self-reported frequency of driving when tired with the relative past experience of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with the relative past experience of crash involvement as a passenger, were also computed. These "focussed" correlations are presented in Table 9.

Table 9. Correlations of specific road-related relative past experience indices and events, with self-reported frequency of performing corresponding on-road risk-taking behaviours (with n- and p-values), in Study 1.

	r	*n*	*p*
Crash involvement as a driver index	-.166	77	.149
Impairment index	.211	74	.071
Been booked	-.283	82	.010*
Booked for speeding	-.107	82	.340
Booked for doing an illegal U-turn	-.222	82	.046*
Booked for running a red light	-.091	74	.439
Booked for driving with a BAC over the legal limit	.033	74	.780
Driving safely while tired	.394	74	.001*
Crash involvement as a passenger	-.326	74	.005*

Significant correlations were observed suggesting that the more often individuals report performing illegal behaviours, the less optimistically biased they are about having been booked in the past, or about having been booked specifically for doing an illegal U-turn. Similarly, the more often individuals report travelling with a driver whose BAC is over the legal limit, the less optimistically biased they are about having been injured in the past as a passenger. In contrast, the more optimistically biased individuals are regarding their ability to drive safely while tired, the more frequently they report having continued to drive even when they were very tired.

Thus, most observed relationships suggest that risk-taking and trauma involvement contribute to past-related optimism bias, rather than vice versa. Fewer relationships were observed than with future-related optimism bias.

6.3.10 The Relationship Of Personal Future Risk Estimates With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

Table 10 presents correlations of the personal future risk indices with an average on-road risk-taking index, with corresponding personal experience indices, and with self-reported crash involvement (from the Demographic and Control Variables Questionnaire).

Table 10: Correlations of personal future risk with the on-road risk-taking index, corresponding personal past experience indices, and self-reported crash involvement (with n- and p-values), in Study 1.

	On-road risk-taking index	*Corresponding personal experience index*	*Crash involvement*
Road-related negative index	.334 (82) .002*	.171 (84) .119	.214 (86) .048*
Road-related positive index	-.101 (81) .368	-.293 (83) .007*	-.117 (85) .287
Road-unrelated negative index	.167 (82) .133	.399 (85) <.001**	.169 (86) .119
Road-unrelated positive index	-.083 (81) .463	.075 (84) .496	-.008 (85) .946
Crash as driver at fault	.264 (82) .017*	-.099 (84) .373	.195 (86) .072
Crash as driver not at fault	.056 (82) .620	-.226 (85) .037*	.116 (86) .811
Crash as passenger	-.073 (82) .517	-.077 (85) .484	.026 (86) .811

Two significant positive correlations were observed between personal future risk of negative road-related events and on-road risk-taking. For negative indices, two further correlations were positive. Negative but nonsignificant correlations were observed for both positive indices. Thus, on-road risk-taking appears to be associated with higher estimates of future risk.

The relationship between personal experience and personal future risk was inconsistent. Two significant negative correlations, and one significant positive correlation were observed. Two further correlations were negative and 2 positive.

One significant positive correlation was observed between personal future risk (road-related negative index) and self-reported crash involvement. Nonsignificant positive correlations were observed with the 4 remaining negative events indices, and nonsignificant negative correlations were observed with the 2 positive events indices.

Personal future risk scores were significantly positively correlated with personal experience scores for 10 of 20 events. A significant negative correlation was observed for one event whose valence was reversed for the two scales.

Two significant positive correlations were observed between personal future risk of negative events and crash involvement. One significant negative correlation was observed for personal likelihood of positive events and crash involvement. Twelve further correlations were in a direction consistent with the view that more self-reported crash involvement is associated with more negative expectations of the future.

Two further road-related personal risk indices were computed by averaging scores for 4 events which involve crashing as a driver (4, 7, 8, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &16).

Correlations were then computed between the corresponding road-related personal future risk and on-road risk-taking indices, and between the personal future likelihood of having 3 consecutive years of not being booked and the average index of behaviours which contribute to the likelihood of being booked. We also computed correlations of the personal future risk scores for being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The correlations of self-reported frequency of driving when tired with the personal future likelihood of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with the personal future risk of crash involvement as a passenger, were also computed. These "focussed" correlations are presented in Table 11.

Table 11: Correlations of specific personal future risk indices and events, with self-reported frequency of performing corresponding on-road risk-taking behaviours (with n- and p-values), in Study 1.

	r	*n*	*p*
Crash involvement as a driver index	.410	80	<.001**
Impairment index	.207	84	.060
3 consecutive years without being booked	.524	85	<.001**
Booked for speeding	.217	86	.045*
Booked for doing an illegal U-turn	.389	86	.001**
Booked for running a red light	-.190	84	.083
Booked for driving with a BAC over the legal limit	.481	86	<.001**
Driving safely while tired	.377	84	<.001**
Crash involvement as a passenger	.072	86	.509

Personal future risk scores were significantly positively correlated with the frequency of performing relevant on-road risk-taking behaviours for 6 of 8 indices.

Estimates of personal future risk of experiencing 5 negative events correlated positively and significantly with the on-road risk-taking index (lowest significant r=.265, n=82, p=.016). Significant negative correlations were observed for 2 positive events (lowest significant r=-.252, n=82, p=.023), but "avoid crash nearly caused by another driver" correlated positively and significantly with the on-road risk-taking index (r=.250, n=82, p=.020). Eleven further correlations were in a direction consistent with the view that more on-road risk-taking is associated with the expectation of greater future experience of negative events and lower future experience of positive events (on and off the road).

6.3.11 Comparison Of The Relationship Of Optimism Bias Regarding The Future Versus The Past With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

The correlations of the relative future risk indices with self-reported on-road risk-taking and crash involvement (from the Demographic and Control Variables Questionnaire), were compared to the correlations of the relative past experience indices with self-reported on-road risk-taking and self-reported crash involvement. Only one significant difference was observed, between the "focussed" correlations of "travel as a passenger of a driver with a BAC over the legal limit" and relative future risk versus relative past experience of injury/death as a passenger ($z=4.066$; next highest $z=1.901$), for which the association with past-related optimism bias was strongest.

6.3.12 Comparison Of The Relationship Optimism Bias Regarding The Future Versus Personal Future Risk Estimates With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

The correlations of the relative future risk indices with self-reported on-road risk-taking and crash involvement (from the Demographic and Control Variables Questionnaire), were compared to the correlations of the personal future risk indices with self-reported on-road risk-taking and self-reported crash involvement. No significant correlation was observed (highest nonsignificant $z=1.154$).

6.3.13 The Relationship Of Self-Reported Risk-Taking On The Road With Self-Reported Involvement In Road (And Other) Trauma

Table 12 presents correlations of the on-road risk-taking index with personal experience indices, and with self-reported crash involvement (from the Demographic and Control Variables Questionnaire). Positive correlations were expected for negative events and negative correlations for positive events.

Table 12: Correlations of the on-road risk-taking index with personal past experience indices, and with self-reported crash involvement (with n- and p-values), in Study 1.

	r	*n*	*p*
Road-related negative index	.360	80	.001*
Road-related positive index	.212	81	ns
Road-unrelated negative index	.075	81	.253
Road-unrelated positive index	-.085	81	.226
Crash as driver at fault	.172	80	.064
Crash as driver not at fault	-.011	81	ns
Crash as passenger	.132	81	.121
Self-reported crash involvement	.319	82	.002*

ns= correlation in the direction opposite to prediction, and thus not significant according to the 1-tailed test employed.

On-road risk-taking correlated positively and significantly with 2 indices of personal experience with negative road-related events. Four further correlations were in the predicted direction but were not significant.

Two further road-related personal experience indices were computed by averaging scores for 3 events which involve crashing as a driver (4, 7, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &14).

Correlations were then computed between corresponding on-road risk-taking and road-related personal experience indices, and between the average index of behaviours which contribute to the likelihood of being booked and the relative past experience of having 3 consecutive years of not being booked. We also computed correlations of personal experience of being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The correlations of self-reported frequency of driving when tired with personal experience of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with personal experience of crash involvement as a passenger, were also computed. These "focussed" correlations are presented in Table 13. Again positive correlations were expected for negative events, and negative correlations were expected for positive events.

Table 13: Correlations of self-reported frequency of performing corresponding on-road risk-taking behaviours with specific personal experience and events, and with self-reported crash involvement (with n- and p-values), in Study 1.

	r	*n*	*p*
Crash involvement as a driver index	.410	80	<.001**
Impairment index	.207	84	.060
Been booked	.524	85	<.001**
Booked for speeding	.016	85	.442
Booked for doing an illegal U-turn	.249	85	.011*
Booked for running a red light	.185	85	.045*
Booked for driving with a BAC over the legal limit	.287	85	.004*
Driving safely while tired[A]	.489	84	<.001**
Crash involvement as a passenger	.307	85	.002*

[A] Tested 2-tailed because the valence of the event is unclear.

Six significant positive correlations were observed between the frequency of performing relevant risky behaviours and personal experience of road-related negative events, as well as "drive safely while tired". The 2 remaining correlations were positive but nonsignificant.

Thus, there is strong evidence for the claim that risk-taking on the road contributed to involvement in road trauma.

6.3.14 Relationship Of Demographic Variables, Driving Experience, And Social Desirability With Optimism Bias Regarding The Past And Future, On-Road Risk-Taking And Involvement In Road (And Other) Trauma.

We computed correlations of age, average number of hours spent driving each week (as a driver and as a passenger), number of years licensed, and social desirability with the relative future risk indices, the relative past experience indices, the average on-road risk-taking index, personal past experience indices and self-reported crash involvement (from the Demographic and Control Variables Questionnaire). The relationship of optimism bias, on-road risk-taking and involvement in road (and other) trauma with gender was assessed employing independent samples t-tests with gender as the grouping variable. All hypotheses were tested 2-tailed.

Optimism bias demonstrated one significant positive correlation with age, for the road-unrelated positive past experience index (r=.243, n=85, p=.025; highest nonsignificant r=.103, n=79, p=.367). Several significant correlations between optimism bias and driving experience were observed. The number of hours participated reported driving (as a driver) on average per week correlated positively and significantly with the road-related negative and positive relative past experience indices (r=.233, n=77, p=.041, r=.284, n=77, p=.012, respectively), relative past experience of being injured in a crash "as a driver" and "as a driver not at fault" (r=.317, n=85, p=.003, r=.329, n=86, p=.002), as well as the road-unrelated negative index (r=.241, n=87, p=.025). The number of hours participated reported driving (as a passenger) on average per week correlated positively and significantly with the road-related negative relative past experience index (r=.405, n=77, p<.001), and relative past experience of being injured in a crash "as a driver not at fault" and "as a passenger" (r=.363, n=86, p=.001, r=.281, n=78, p=.013, respectively). Finally, the number of years participants reported having held their license correlated significantly and positively with the road-unrelated positive index (r=.282, n=85, p=.009). Optimism bias was not significantly associated with gender (highest nonsignificant t_{85}=1.05, p=.298) or social desirability (highest nonsignificant r=.187, n=88, p=.081). Thus, more driving exposure is associated with greater optimism bias, particularly in relation to road-related events, which is consistent with the claim that optimism bias is promoted by experience of safety.

The on-road risk-taking index was not significantly associated with age (r=-.164, n=87, p=.130), gender (t_{84}=1.31, p=.194), number of hours spent driving as a driver (r=.196, n=86, p=.071), or years licensed (r=-.128, n=87, p=.239). However on-road risk-taking was significantly negatively correlated with number of hours spent driving as a passenger (r=-.274, n=87, p=.011) and social desirability (r=-.385, n=87, p<.001). Thus, self-reports of on-road risk-taking may have been distorted by social desirability. Alternatively, people who have a tendency to conform to social norms may be less likely to take risks.

Personal past experience indices and self-reported crash involvement were regarded as indicators of involvement in road (and other) trauma. These indices demonstrated no significant correlations with age (highest nonsignificant r=-.168, n=90, p=.113), gender (highest nonsignificant t_{87}=.93, p=.353), or social desirability (r=-.190, n=90, p=.072). Number of hours spent driving as a driver correlated positively and significantly with the road-related negative and positive personal past experience indices (r=.251, n=88, p=.018, r=.381, n=88, p<.001, respectively), and past experience of being "injured in a crash as a passenger" (r=.476, n=89, p<.001). Number of hours spent driving as a passenger correlated significantly and positively with past experience of being injured in a crash "as a driver at fault" and "as a driver not at fault" (r=.346, n=88, p<.001, r=.392, n=89, p<.001, respectively), as well as with the road-unrelated negative index (r=.294, n=89, p=.005). Years licensed correlated significantly only with the road-unrelated positive index (r=.316, n=89, p=.003). Thus, greater driving exposure is associated, unsurprisingly, with greater involvement in road-trauma.

6.4 DISCUSSION

The present results confirm that individuals are optimistically biased regarding road-related events, and reveal complex relationships with risky driving and involvement in road trauma. Thus, interventions to reduce road-related optimism bias could thus benefit road safety.

On average subjects in the present sample believed that they were less likely than their peers to experience negative road-related events, as well as road-unrelated events. The observation of optimism bias regarding positive road-related and road-unrelated events suggests that these results are unlikely to be the result of a response bias. Road-related optimism bias was observed for all

indices and events, whereas road-unrelated optimism bias was observed for both indices, and the majority of events.

Past-related optimism bias was also observed in the present sample. That is, on average, subjects believed that they have had less past experience of negative events, and more past experience of positive events. Past-related optimism bias was observed for the negative but not the positive road-related index, and for both the negative and the positive road-unrelated indices. Only one event produced relative scores in a direction inconsistent with past-related optimism bias.

Generally, road-related optimism bias was greater than road-unrelated optimism bias. Significant differences were observed for the negative and positive relative future risk indices, and for the negative relative experience index. For the positive relative experience index, road-unrelated optimism bias was significantly greater than road-related optimism bias.

There was some confirmation of earlier findings that past-related optimism bias is greater than future-related optimism bias. Specifically, relative experience scores for the "driver at fault" index were significantly greater than relative future risk estimates for this index. Means were in the same direction but not significantly different for several further indices.

Evidence for a positive association between past- and future-related optimism bias was strong. Such an association is consistent with the hypothesis that belief in a superior past contributes to expectation of a superior future, such that targeting past-related optimism bias might reduce future-related optimism bias. Of course, the positive association may also indicate that future-related optimism bias contributes to past-related optimism bias, or that the two forms of optimism bias have shared mechanisms.

On-road risk-taking was reportedly fairly low in the present sample (as was involvement in road trauma). The observed significant positive correlation of self-reported on-road risk-taking with social desirability may reflect distortion of self-reports. However, this finding may also indicate that individuals who tend to conform to social expectations are more likely to obey the road rules, than those who do not conform.

Observed relationships between relative future risk and on-road risk-taking generally suggest that less on-road risk-taking is associated with greater optimism bias. Negative relationships were observed consistently for the main indices, the "focussed" indices, and the events. These results are consistent with the view than on-road risk-taking influences optimism bias rather than vice versa.

Similarly, lower on-road risk-taking was generally associated with greater relative experience scores for the indices, "focussed" indices, and events. There was no significant difference in the strength of relationships observed between on-road risk-taking and relative future risk versus between on-road risk-taking and relative experience.

Personal future risk estimates were also consistently related with on-road risk-taking. Positive and significant relationships were observed for negative indices and events, whereas significant negative relationships were observed for positive events. Again, these results are consistent with the view that risk-taking influences risk perception rather than vice versa. Whilst relationships of on-road risk-taking with personal risk estimates appeared to be stronger and more consistent than with relative risk estimates, this impression was not supported by statistical analyses.

Nonetheless, some observed correlations were consistent with the view that risk-perception influences risk taking. For example, relative future risk of avoiding a crash nearly caused by another driver, and of driving safely while tired, correlated positively and significantly with the on-road risk-taking index. Similarly, relative past experience of driving safely while tired also correlated significantly and positively with the frequency of continuing to drive when tired. Perceiving a high likelihood of having 3 consecutive years without being booked was associated with frequent performance of illegal driving behaviours (e.g. running a red light, driving with a BAC above the legal limit). Similarly, perceiving a high likelihood of driving safely while tired was associated with

frequently continuing to drive when tired. Perceiving a high likelihood of avoiding a crash nearly caused by another driver was associated with a high score on the on-road risk-taking index.

The relationships observed between perceived risk (relative and personal) and road-trauma involvement were generally consistent with the above findings taken in conjunction with the consistently observed significant positive relationship between on-road risk-taking and road-trauma involvement.

Relative future risk for negative events generally demonstrated significant negative correlations with personal experience, whereas positive correlations were observed for positive events. For relative future risk indices, most correlations conformed to this pattern, although there was some inconsistency, and a significant positive correlation was observed for relative future risk of injury or death as a passenger. Correlations with self-reported crash involvement were generally negative, and were significant for 4 events. These findings are consistent with the view that low past experience of negative events and high past experience of positive events contributes to optimism bias.

Similarly, the relative road-related negative experience index and relative experience of four events demonstrated significant negative correlations with self-reported crash involvement. Relationships of road-trauma involvement with relative future risk versus relative past experience did not differ significantly.

Personal future risk estimates also demonstrated relationships with past experience, again suggesting that good experiences in the past produce and expectation of good experiences in the future. Two main negative indices demonstrated significant positive correlations with trauma involvement (personal experience ratings and self-reported crash involvement), and most remaining correlations were positive but not significant. Correlations between the positive indices and self-reported crash involvement were negative but not significant. Personal experience event scores demonstrated significant positive correlations with personal future risk estimates. For self-reported crash involvement, significant positive relationships were observed for negative events, whereas significant negative relationships were observed for positive events. The general impression that correlations were stronger and more consistent for personal than for relative future risk estimates was again not confirmed by statistical analyses.

Some observed relationships were consistent with the view that risk perception influences involvement in road trauma rather than vice versa. For example, high optimism bias regarding the chances of being injured in a crash as a passenger was associated with greater experience of this event. Similarly, high perceived personal risk of having a crash as a driver not at fault was associated with low personal experience of this event.

Risk perception, on-road risk-taking and involvement in road (and other) demonstrated to significant association with gender and only a limited relationship with age (which had a restricted range in the present sample, possibly hiding relationships). Thus, no target audience need be isolated in these terms for the interventions we aim to develop. Driving exposure (in terms of hours spent driving and number of years licensed) demonstrated convincing positive associations with optimism bias. These findings are consistent with the view that extensive experience of safe driving may contribute to optimism bias regarding road-related events, supporting our concerns in relation to driver training. The positive association of driving exposure with negative and positive experiences on the road is unsurprising.

Although evidence is mostly consistent with the view that risk-taking and trauma involvement influences risk perception, rather than vice versa, the aim of manipulation optimism bias remains justifiable. First, the present data are correlational, and so causal relationships are difficult to infer. Second, some of the present results suggest an influence of optimism bias on on-road risk-taking and road trauma involvement, at least for some events. Indeed it is likely that risk perception and risk-taking/trauma-involvement exert a mutual influence on one another and these relationships are difficult to tease apart in a correlational design. With effective manipulation of optimism bias, later

impacts on risk-taking and trauma involvement could be assessed. Any such impact could be of substantial practical importance.

Study 2 aimed to develop and assess manipulations designed to reduce optimism bias regarding the future and the past.

7 STUDY 2: DEVELOPMENT OF AN INTERVENTION DESIGNED TO REDUCE ROAD-RELATED OPTIMISM BIAS IN A TERTIARY STUDENT SAMPLE

Study 2 represents an evaluation of techniques developed to reduce future- and past-related optimism bias, employing Psychology I students at the University of Sydney. We also sought to replicate several Study 1 findings (e.g. cross-sectional interrelationships of future-related optimism bias, past-related optimism bias, risk-taking on the road, and experience of road trauma (see Appendix 4 for relevant results).

7.1 DESIGN

Study 2 employed a 3 x 2 between-subjects design. Subjects received instruction designed either to reduce future-related optimism bias, to reduce past-related optimism bias, or to have no effect on either future- or past-related optimism bias. Half of the subjects in each condition made future risk estimates before experience ratings, whereas the remaining subjects in each condition made experience ratings before future risk estimates.

7.2 METHODS

7.2.1 Subjects And Sampling

73 Psychology I students at the University of Sydney volunteered to participate in a study on "beliefs about road use" for course credit, by writing their names on a sign-up sheet that was posted on a notice board in the Department of Psychology. Again, the sign-up sheet explicitly limited volunteers to licensed drivers between 18-24 years of age.

Because the instructions mediating the main manipulation were presented at the beginning of each experimental session verbally and by overhead, all subjects in each session had to be exposed to the same instructions. Subjects were allocated to the 3 instruction conditions on the basis of the experimental session for which they signed up. Because all sessions were run at the same time of day, and because an effort was made to alternate conditions, this procedure is not likely to involve any systematic self-selection effects. The different versions of the Optimism Bias Questionnaire (future risk estimates before versus after experience ratings) were randomly distributed amongst the subjects in each session.

7.2.2 Materials

Instruction Overheads

The instructions designed to manipulate optimism bias were presented by overhead. Three versions of the overheads were employed to administer 3 different sets of instructions.

The instructions designed to reduce optimism bias regarding the future read:

"One of the questionnaires you are about to complete asks you to estimate the likelihood that:
1. You will experience various events in the future
2. The average Sydney University student of your age and gender will experience various events in the future.
Before you complete this task you need to be aware of several things:
a) People often think that they are better off than their peers.
They estimate that the likelihood that they will experience negative events is LOWER than the likelihood that their average peer will experience negative events.
Similarly, they estimate that the likelihood that they will experience positive events is HIGHER than the likelihood that their average peer will experience positive events.
For example, many drivers think that they are less likely to crash, and that they are better and safer drivers, compared to their average peer. In addition, you may think that you are less likely than your University peers to be hospitalised, and more likely to get good marks. We call this phenomenon "unrealistic optimism".
b) Thinking that you do not think this way is itself unrealistic optimism .... everybody else probably thinks it is not them.
c) Bad things happen to people, and there is often no good reason why these bad things are less likely happen to you than to your peers.
For example, road crashes are the No. 1 killer for accidental risks among young people, and tens of thousands of young people end up in hospital from road crashes each year. You could be one of them.
d) Unrealistic optimism is very important because believing that bad things are less likely than average to happen to you makes you behave dangerously.
The single most important thing you can do to reduce the chances of bad things, like being very sick, happening to you is to believe that they ARE JUST AS LIKELY TO HAPPEN TO YOU AS TO YOUR PEERS.
It is very important that you learn not to be unrealistically optimistic biased. There are several ways you can do this:
- Do not deny your risk, face it and do something about it
- Remember that you are not the only one who takes precautions; other people take them too
- Realise that other people are not the only ones who make mistakes; you make them too
- Do not stereotype people who suffer negative events; many negative events can happen to anyone
- Remember that although some events, like serious car crashes, seem to happen a lot, there are many drivers who never have a serious crash
Please remember these points when you respond to the questionnaire (but make sure your answers reflect what you REALLY think right now). Also, please try to guard against being optimistically biased in future. Not being unrealistically optimistic could be very important to your health."

These instructions incorporate strategies drawn from the driver training program we plan to assess (e.g. identification of optimism bias and its importance). The instructions also incorporate messages that we have found to be effective in reducing faulty risk perceptions. For example, we identify that "road crashes are the No.1 killer for accidental risks among young people". Further refinements included an effort to address the possibility that subjects will not modify their thinking because of an optimistically biased belief that they are not optimistically biased. Further, the dangers of optimistically biased thinking were emphasized in order to strengthen motivation to avoid it. Finally, strategies for reducing optimism bias based on theories of the phenomenon were offered.

The instructions designed to reduce optimism bias regarding the past read:

One of the questionnaires you are about to complete asks you to identify how often:

1. Various events have happened to you in the past
2. Various events have happened to he average Sydney University student of your age and gender in the past.

Before you complete this task you need to be aware of several things:

a) People often think that they have had a better past than their peers.

They estimate that they have experienced negative events LESS often than has their average peer.

Similarly, they estimate that they have experienced positive events MORE often than has their average peer.

For example, many drivers think that they have crashed less often, and that they have been better and safer drivers, compared to their average peer. In addition, you may think that you have been hospitalised less often and gotten better school marks than your University peers. We call this phenomenon "unrealistic optimism".

b) Thinking that you do not think this way is itself unrealistic optimism .... everybody else probably thinks it is not them.

c) Bad things happen to people, and there is often no good reason why these bad things should have happened to you less often than to your peers.

d) Unrealistic optimism is very important because believing you have less experience of bad things than average, may make you believe that bad things are less likely than average to happen to you in the future, which makes you behave dangerously.

The single most important thing you can do to reduce the chances of bad things, like being very sick, happening to you is to believe that they HAVE HAPPENED TO YOU AS MUCH AS TO YOUR PEERS.

It is very important that you learn not to be unrealistically optimistic biased. There are several ways you can do this:

- Do not deny your level of experience, face it and do something about it
- Remember that you are not the only one who has taken precautions; other people have taken them too
- Realise that other people are not the only ones who have made mistakes; you have made them too
- Do not stereotype people who have suffered negative events
- Remember that although some events, like serious car crashes, seem to happen a lot, there are many drivers who have never had a serious crash

Please remember these points when you respond to the questionnaire (but make sure your answers reflect what you REALLY think right now). Also, please try to guard against being optimistically biased in future. Not being optimistically biased could be very important to your health."

These instructions were constructed by modifying instructions regarding future-related optimism bias.

The control instructions read:

"One of the questionnaires you are about to complete asks you to estimate the likelihood that:

1. You will experience various events in the future
2. The average Sydney University student of your age and gender will experience various events in the future."

or

One of the questionnaires you are about to complete asks you to identify how often:

1. Various events have happened to you in the past
2. Various events have happened to he average Sydney University student of your age and gender in the past.

Consideration was given to matching the control instructions to the other instructions for length. However, the notion was dismissed because any material of sufficient apparent relevance (and thus plausibility) may have influenced optimism bias in unintended and unknown ways.

Optimism Bias Questionnaire: (see Appendix 1)

The Optimism Bias questionnaire employed in Study 2 was the same as that employed in Study 1 apart from the addition of a counterbalance of "time order" (future versus past ratings first).

Half of the sample received a version of the Optimism Bias requiring them to make future risk estimates for the self and the average peer before making experience ratings for the self and the average peer (as in Study 1). The remaining subjects received a version of the questionnaire requiring them to make experience ratings for the self and the average peer before future risk estimates. The main reason for this change was to ensure that for half of the subjects exposed to instructions designed to reduce optimism bias regarding a particular time frame, optimism bias regarding this time frame was assessed immediately (to maximise the effects of the instructions).

On-road Risk-taking Questionnaire: (see Appendix 1)

The On-road Risk-taking Questionnaire employed in Study 2 was identical to that employed in Study 1.

Demographic and control variables questionnaire: (see Appendix 1)

A slight modification was made to the demographics and control variables questionnaire employed in Study 1 to improve its clarity. Specifically, in the item requesting details of personal crash involvement the words "as a driver" were added. In addition subjects were required to rate their mood on line scales which were labeled at the extremes (tense/relaxed, calm/excited, happy/sad, withdrawn/sociable, interested/ bored).

7.2.3 Procedure

Questionnaires were administered according to the Study 1 protocol, with the exception that after a receiving general instructions, but before completing questionnaires, the manipulation was administered.

They were then given instructions designed either to, reduce optimism bias regarding the future, to reduce optimism bias regarding the past, or to have no effect on either future- or past-related optimism bias. These instructions were displayed on an overhead projector and read out by the experimenter.

Questionnaires were then randomly distributed so that half the subjects received different versions of the Optimism Bias Questionnaire.

7.3 STATISTICAL ANALYSIS

The raw data were analysed with SPSS (Statistical Package for the Social Sciences). The Type I error rate for all analyses was set at .05.

Some of the analyses conducted in Study 1 were conducted again here, with modifications designed to assess the impact of the manipulation on optimism bias (see Appendix 4 for additional analysis).

First, we considered sample characteristics in terms of age, gender, driving exposure and tendency to conform to social expectations (including group differences).

Relative scores were calculated for each item of the Optimism Bias Questionnaire, as in Study 1. Road-related relative future likelihood negative and positive indices, road-unrelated relative future likelihood negative and positive indices, and 3 average relative future risk indices regarding accident

involvement (as a driver at fault, as a driver not at fault, and as a passenger), were also computed as in Study 1. Parallel relative experience indices were also computed as in Study 1.

The optimism bias (future-related and past-related) demonstrated by subjects exposed to the instruction designed to reduce future-related optimism bias was compared to optimism bias demonstrated by subjects exposed to the corresponding control instruction. Similarly, the optimism bias (past-related and future-related) demonstrated by subjects exposed to the instruction designed to reduce past-related optimism bias was compared to optimism bias demonstrated by subjects exposed to the corresponding control instruction. These comparisons were made employing a 2 factor ANOVA. The between subjects factors were "instruction" (treatment versus control) and "time order" (future risk estimates versus past experience ratings first). This allowed for consideration of the main effect of "instruction", as well as its interaction with "time order". Significant interactions were investigated further by employing an independent samples t-test to compare the two relevant "instruction conditions" within each level of "time order".

Optimism bias was assessed by comparing relative index and event scores to the score representing no difference between self and peers (0) using a 1-tailed single sample t-test. A sample average which is significantly greater than 0 reflects optimism bias. Optimism bias was assessed for each instruction condition, if a main effect of "instruction" was observed for either comparison.

A general on-road risk-taking index was computed by adding all items form the On-road Risk Taking Questionnaire which were phrased in negative terms, and subtracting those which were phrased in positive terms.

The instruction conditions were compared in terms of risk taking and involvement in road (and other) trauma employing ANOVAs structured as outlined above. Correlations between any two variables which demonstrated a main effect of "instruction" were computed within each level of that factor, in order to avoid spurious correlations.

7.4 RESULTS

7.4.1 Sample Characteristics

Subjects given control instructions did not differ in terms of age, gender, socioeconomic status, average hours spent driving (as a driver) per week, or number of years licensed compared to subjects given instructions designed to reduce future-related optimism bias ($F_{1,44}$=2.891, p=.096; χ^2=.882, p=.348; $F_{1,38}$=.003, p=.954; $F_{1,44}$=.002, p=.967; $F_{1,38}$=3.352, p=.075, respectively), or compared to subjects given instructions designed to reduce past-related optimism bias ($F_{1,45}$=.323, p=.572; χ^2=.549, p=.489; $F_{1,37}$=1.540, p=.222; $F_{1,45}$=.893, p=.350; $F_{1,37}$=.402, p=.530, respectively).

The sample was 64.4% female. Subjects had a mean age of 19 years (s.d.=1.0), had held their licenses for a mean of 2.3 years (s.d.=1.3), and spent on average 6.6 hours per week driving as a driver (s.d.=5.8), and 4.1 hours as a passenger (s.d.=4.4). The mean score for social desirability was a moderate 4.65 (from a possible 13, s.d.=2.31).

7.4.2 Comparison Of Optimism Bias Regarding Various Aspects Of Future Road Use For Subjects Exposed To Different Instructions

Figure 7 presents mean relative future risk scores for each index (with S.E.M bars), for subjects exposed to instructions designed to reduce optimism bias regarding the future, versus instructions designed to reduce optimism bias regarding the past, versus control instructions.

Relative future risk scores of subjects exposed to instructions designed to reduce optimism bias regarding the future did not differ significantly from relative future risk scores of subjects exposed to control instructions for the road-related negative and positive indices ($F_{1,43}$=.889, p=.176, $F_{1,43}$=.300, p=.294, respectively). There was also no significant effect of the instructions for the road-unrelated negative index (mean in a direction opposite to prediction and thus nonsignificant according to the 1-tailed test employed) and the road-unrelated positive index ($F_{1,43}$=.028, p=.435). There was also no significant effect of the instructions for crash involvement as a driver at fault (mean in a direction opposite to prediction and thus nonsignificant according to the 1-tailed test employed), crash involvement as a driver not at fault ($F_{1,44}$=.000, p=.985), or crash involvement as a passenger ($F_{1,44}$=1.347, p=.126).

Relative future risk scores were significantly lower for subjects exposed to instructions designed to reduce optimism bias regarding the future compared to subjects exposed to control instructions for 1 of 11 road-related negative events ("Be killed in a crash as a passenger": $F_{1,44}$=4.198, p=.041), and 1 of 5 road-related positive events ("Have 3 consecutive years without being booked": $F_{1,45}$=7.025, p=.006).

Two significant effects of the instructions on road-unrelated negative or positive events were observed ("Have the car you are driving stolen": $F_{1,44}$=3.017, p=.045; "Own your own home": $F_{1,44}$=4.420, p=.021). Means were in the predicted direction for a further 6 road-related negative events and a further 2 road-related positive events, and no further road-unrelated events.

The interaction between the nature of the instructions (future-related versus control) and the order of completing the future-related versus the past-related optimism bias scale was not significant for any indices or events.

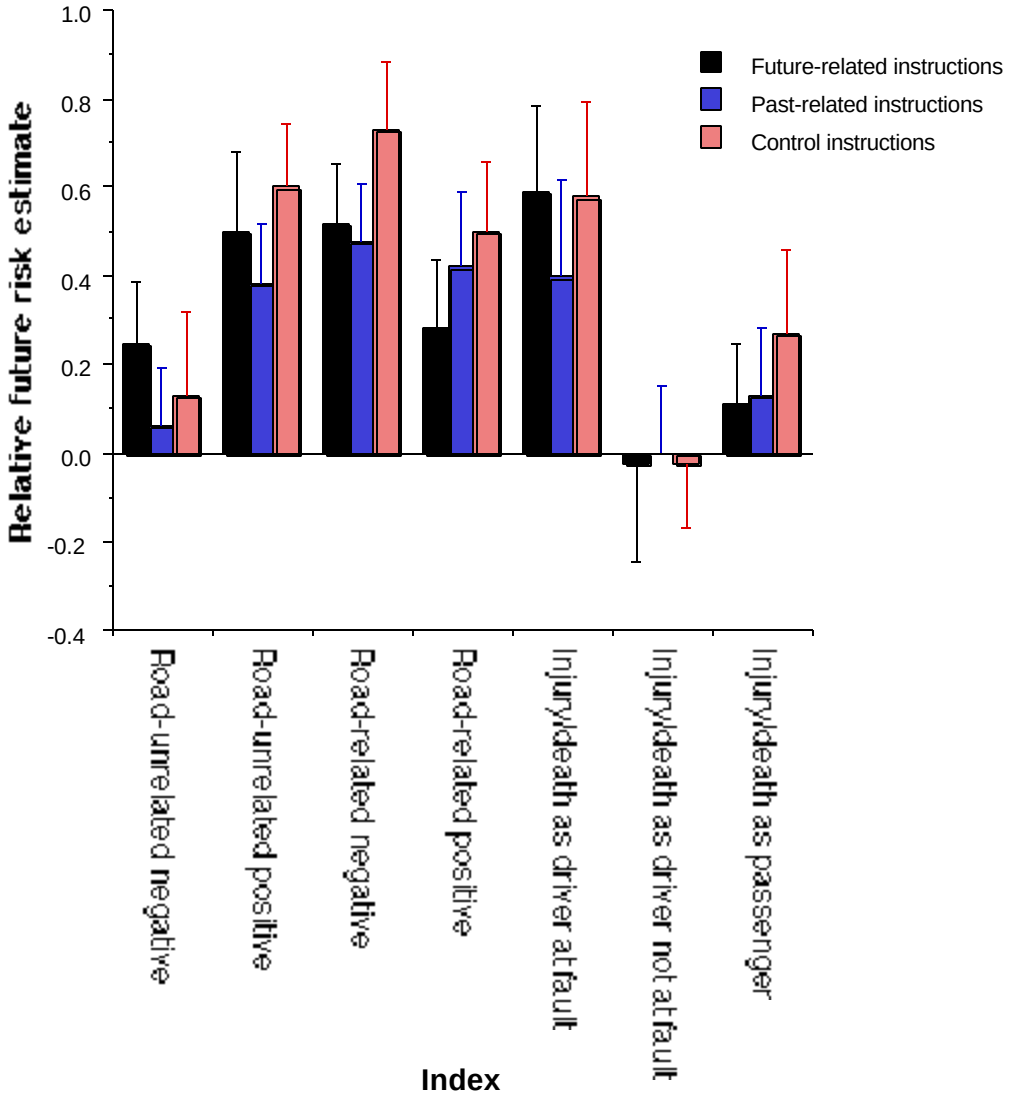
Relative future risk scores for subjects exposed to instructions designed to reduce optimism bias regarding the past did not differ from those for subjects exposed to control instructions for the road-related negative and positive indices ($F_{1,42}$=.385, p=.279, $F_{1,42}$=.000, p=.995, respectively), or for the road-unrelated negative and positive indices ($F_{1,42}$=.216, p=.323, $F_{1,42}$=.614, p=.219, respectively). There was also no significant difference in relative future risk scores for crash involvement as a driver at fault ($F_{1,42}$=.169, p=.342), as a driver not at fault (mean in the direction opposite to prediction and thus nonsignificant according to the 1-tailed test employed), or as a passenger ($F_{1,45}$=.763, p=.194).

Relative future risk scores were significantly lower for subjects exposed to instructions designed to reduce optimism bias regarding the past compared to subjects exposed to control instructions for 1 of 11 road-related negative events ("Have a crash as a driver at fault": $F_{1,44}$=4.449, p=.021), and for 1 road-unrelated negative event ("Have the car you are driving stolen": $F_{1,45}$=4.010, p=.026), but for no further road-related or road-unrelated negative or positive events. Means were in the predicted direction for a further 6 road-related negative events, 3 road-related positive events, 2 road-unrelated negative events, and 2 road-unrelated positive events.

The interaction between the nature of the instructions (past-related versus control) and the order of completing the future-related versus the past-related optimism bias scale was significant for 2 events ("Not be hospitalised in the next 5 years for illness or injury": $F_{1,44}$=9.265, p=.002; "Own your own home": $F_{1,44}$=4.231, p=.023). For the second of these events past-related instructions were effective in reducing relative future risk only if future risk was estimated first. In contrast, for the first event past-related instructions reduced relative future risk only if experience ratings were made first.

Thus, there is some evidence for the that the instructions designed to reduce future-related optimism bias were effective. The instructions designed to reduce past-related optimism bias also reduced relative future risk scores.

Figure 7: Mean relative future risk for the road-related negative, road-related positive, road-unrelated negative and road-unrelated positive indices, and the index regarding injury/death as a driver at fault, as a driver not at fault, and as a passenger, for subjects exposed to instructions designed to reduce optimism bias regarding the future, versus instructions designed to reduce optimism bias regarding the past, versus control instructions, in Study 2.



7.4.3 Optimism Bias Regarding Various Aspects Of Future Road Use

Relative future risk scores were significantly greater than zero for the road-related negative and positive indices (t_{71}=7.32, p<.001, t_{72}=4.36, p<.001, respectively), and for the road-unrelated positive index (t_{69}=5.60, p<.001). The mean for the road-unrelated negative index did not differ significantly from zero (t_{71}=1.56, p=.062), although it was positive. Optimism bias was also demonstrated for crash involvement as a driver at fault (t_{72}=4.47, p<.001) and as a passenger

(t_{72}=1.81, p=.038), but not as a driver not at fault (mean in the direction opposite to prediction and thus nonsignificant according to the 1-tailed test employed).

Relative future risk scores were significantly greater than zero for 7 of 10 road-related negative events (lowest significant t_{72}=3.78, p<.001; excluding 1 event tested separately by group), 3 of 4 road-related positive events (lowest significant t_{72}=2.24, p=.014; excluding 1 event tested separately by group), 1 of 3 road-unrelated negative events (t_{71}=1.93, p=.029; excluding 1 event tested separately by group), and 1 of 3 road-unrelated positive events (t_{71}=7.75, p<.001; excluding 1 event tested separately by group). Only 2 events demonstrated relative scores lower than zero (and thus nonsignificant according to the 1-tailed test employed).

Several events were tested separately by group because of significant main effects of instructions. The only event to demonstrate a significant main effect for both comparisons was "having the car you are driving stolen". Optimism bias was not observed amongst subjects given future-related instructions or past-related instructions (t_{22}=1.44, p=.083, t_{23}=1.22, p=.118, respectively), but was observed amongst subjects given control instructions (t_{25}=3.19, p=.002). Several events demonstrated a significant main effect for the future-related versus control instructions comparison only. Optimism bias regarding the likelihood of "having 3 consecutive years without being booked" was not observed amongst subjects given future-related instructions (t_{22}=1.32, p=.100), but was observed amongst subjects given control instructions (t_{25}=4.93, p<.001) or past-related instructions (t_{23}=2.78, p=.006). Optimism bias regarding the likelihood of "own your own home" was not observed amongst subjects given future-related instructions (t_{22}=.59, p=.279) or past-related instructions (t_{22}=1.10, p=.142), but was observed amongst subjects given control instructions (t_{24}=3.12, p=.002). Optimism bias regarding the likelihood of "being killed in a crash as a passenger" was not observed amongst subjects given future-related instructions (mean in a direction opposite to prediction and thus nonsignificant according to the 1-tailed test employed), past-related instructions (mean in a direction opposite to prediction and thus nonsignificant according to the 1-tailed test employed), or control instructions (t_{25}=.49, p=.316). Only one event demonstrated a significant main effect for the past-related versus control comparison only. Optimism bias regarding the likelihood of "have a crash as a driver at fault" was not observed amongst subjects given past-related instructions (t_{23}=1.66, p=.055), but was observed amongst subjects given control instructions (t_{23}=3.95, p=.001) or future-related instructions (t_{22}=2.87, p=.005).

These findings further indicate that both future-related and past-related instructions may reduce future-related optimism bias, and that this efficacy generalises from road-related to road-unrelated events.

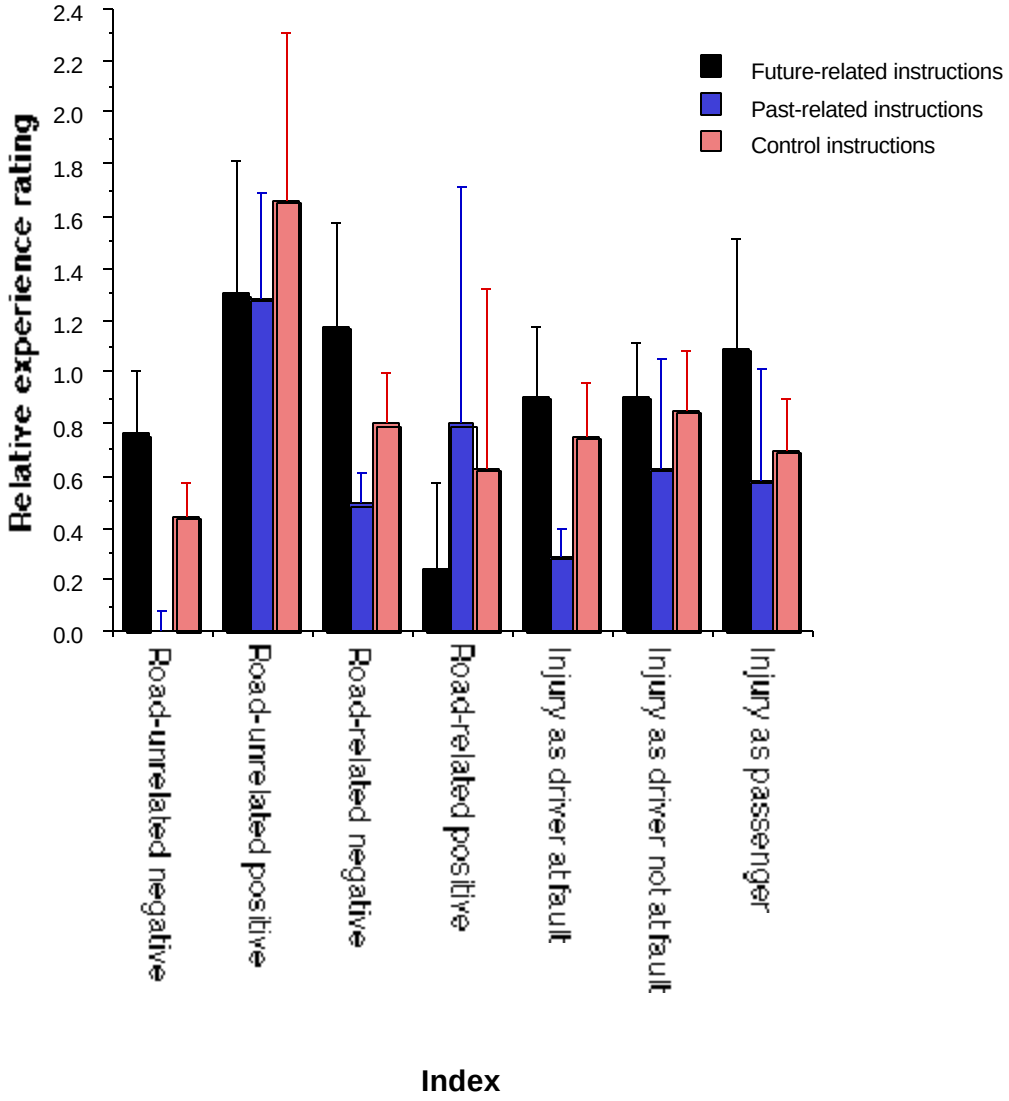
7.4.4 Comparison Of Optimism Bias Regarding Various Aspects Of Past Road Use For Subjects Exposed To Different Instructions

Figure 8 presents mean relative past experience scores for each index (with S.E.M. bars), for subjects exposed to instructions designed to reduce optimism bias regarding the future, versus instructions designed to reduce optimism bias regarding the past, versus control instructions.

Relative past experience scores were significantly lower for subjects exposed to instructions designed to reduce optimism bias regarding the past compared to subjects exposed to control instructions for the road-unrelated negative index (F_{42}=5.808, p=.010) and crash involvement as a driver at fault (F_{42}=2.863, p=.049). The instructions had no significant effect for the road-related negative index (F_{42}=1.472, p=.116), the road-related positive index (means in a direction opposite to prediction and thus nonsignificant according to the 1-tailed test employed), the road-unrelated positive index (F_{42}=.009, p=.474), crash involvement as a driver not at fault (F_{44}=.323, p=.287), or as a passenger (F_{44}=.000, p=.988).

Relative past experience scores were significantly lower for subjects exposed to instructions designed to reduce optimism bias regarding the past compared to subjects exposed to control instructions for 2 of 10 road-related negative events ("Injured in a crash as a driver at fault": see above; "Booked for running a red light": F_{45}=3.181, p=.041), and 2 of 5 road-unrelated negative events ("Have pneumonia": F_{46}=5.287, p=.013;

Figure 8: Mean relative past experience for the road-related negative, road-related positive, road-unrelated negative and road-unrelated positive indices, and the index regarding injury as a driver at fault, as a driver not at fault, and as a passenger, for subjects exposed to instructions designed to reduce optimism bias regarding the future, versus instructions designed to reduce optimism bias regarding the past, versus control instructions, in Study 2.



"Had your wallet stolen": F_{45}=5.227, p=.014). The instructions had no significant effect on any positive road-related or road-unrelated events.

Means were in the predicted direction for a further 6 road-related negative events, 2 road-related positive events, 3 road-unrelated negative events, and 2 road-unrelated positive events.

The interaction between the nature of the instructions (past-related versus control) and the order of completing the future-related versus the past-related optimism bias scale was significant for the road-related positive index ($F_{1,44}$=4.231, p=.023). Past-related instructions were effective in reducing past-related optimism bias only if experience ratings were made second.

Relative past experience scores were not significantly lower for subjects exposed to instructions designed to reduce optimism bias regarding the future compared to subjects exposed to control instructions for the road-related negative and positive indices ($F_{1,41}$=.670, p=.209, $F_{1,41}$=.936, p=.170, respectively), or for the road-unrelated negative and positive indices ($F_{1,41}$=1.915, p=.087, $F_{1,41}$=.005, p=.472, respectively). The instructions also had no significant effect for crash involvement as a driver at fault ($F_{1,41}$=.211, p=.324), as a driver not at fault ($F_{1,41}$=.051, p=.412), and as a passenger ($F_{1,41}$=.522, p=.237).

Relative past experience scores for subjects exposed to instructions designed to reduce optimism bias regarding the future did not differ significantly from those of subjects exposed to control instructions for any road-related or road-unrelated negative or positive events. Means were in the predicted direction for 2 road-related positive events, 2 road-unrelated negative events, and 2 road-unrelated positive events.

The interaction between the nature of the instructions (past-related versus control) and the order of completing the future-related versus the past-related optimism bias scale was also nonsignificant for all events.

Thus instructions designed to reduce past-related optimism bias, but not instructions designed to reduce future-related optimism bias, are effective in reducing past-related optimism bias.

7.4.5 Optimism Bias Regarding Various Aspects Of Past Road Use

Relative past experience scores were significantly greater than zero for the road-related negative index (t_{68}=5.67, p<.001; road-related positive index: t_{68}=1.41, p=.082), and for the road-unrelated positive index (t_{70}=4.64, p<.001). Past-related optimism bias was also demonstrated for crash involvement as a driver not at fault (t_{71}=4.62, p<.001), and as a passenger (t_{71}=3.82, p<.001).

Two indices were tested separately by group because of significant differences between the past-related instruction and control instruction conditions. Past-related optimism bias was not observed for the road-unrelated negative index amongst subjects given past-related instructions (t_{23}=.00, p=1.000), but was observed amongst subjects given control instructions or future-related instructions (t_{25}=3.38, p=.001, t_{22}=3.12, p=.003, respectively), but not. Past-related optimism bias was observed regarding crash involvement as a driver at fault for subjects given future-related, past-related, or control instructions (t_{21}=3.36, p=.002, t_{23}=2.60, p=.008, t_{25}=3.71, p=.001, respectively).

Relative past experience scores were significantly greater than zero for each of 9 road-related negative events (lowest significant t_{71}=3.28, p=.001; excluding 2 events tested separately by group), no road-related positive events (highest nonsignificant t_{68}=1.18, p=.122), 1 of 2 road-unrelated negative events (t_{71}=2.99, p=.002; excluding 2 events tested separately by group), and 1 of 2 road-unrelated positive events (t_{71}=4.49, p<.001). All events demonstrated relative scores greater than zero.

Three events were tested separately by group because of significant differences between the past-related instruction and control instruction conditions. Past-related optimism bias regarding the likelihood of "had pneumonia" was observed amongst subjects given future-related instructions or control instructions (t_{21}=2.59, p=.009, t_{25}=2.97, p=.003, respectively), but not amongst subjects given past-related instructions (t_{23}=1.45, p=.081). In relation to "had your wallet stolen", past-

related optimism bias was observed amongst subjects given future-related or control instructions (t_{21}=2.19, p=.020, t_{25}=4.20, p<.001, respectively), but not amongst subjects given past-related instructions (t_{23}=.21, p=.417). In relation to "booked for running a red light", past-related optimism bias was observed amongst subjects given future-related, past-related or control instructions (t_{21}=2.70, p=.007, t_{21}=2.70, p=.007, t_{23}=2.85, p=.005, respectively). (See above for results regarding "have a crash as a driver at fault".)

7.4.6 Comparison Of On-Road Risk-Taking And Involvement In Road (And Other) Trauma For Subjects Exposed To Different Instructions

Table 14 presents the main effects of instruction for on-road risk-taking and involvement in road (and other) trauma.

Table 14: Main effects of instructions for the future-related versus control, and the past-related versus control, comparison, for on-road risk-taking and involvement in road (and other) trauma, in Study 2.

Variable	*Future-related versus control*		*Past-related versus control*	
On-road risk-taking				
Total index	$F_{1,43}$=2.771	.103	$F_{1,45}$=.160	.691
Run a red light	$F_{1,45}$=1.995	.165	$F_{1,46}$=.523	.473
Keep driving even though you are very tired	$F_{1,43}$=.005	.942	$F_{1,45}$=.264	.610
Do an illegal U-turn	$F_{1,43}$=2.449	.125	$F_{1,45}$=1.955	.169
Drive with a blood alcohol content above the legal limit	$F_{1,43}$=.885	.325	$F_{1,45}$=.278	.601
Travel as a passenger of a driver with a blood alcohol content above the legal limit	$F_{1,43}$=2.099	.155	$F_{1,45}$=.000	.995
Exceed the speed limit by no more than 15km/hr	$F_{1,45}$=4.156	.047*	$F_{1,46}$=.094	.761
Wear a seatbelt	$F_{1,45}$=.000	.997	$F_{1,46}$=.076	.783
Trauma involvement				
a) Personal experience				
Road-related negative index	$F_{1,42}$=.528	.472	$F_{1,43}$=.045	.832
Road-related positive index	$F_{1,42}$=.829	.368	$F_{1,43}$=.002	.968
Road-unrelated negative index	$F_{1,43}$=.058	.811	$F_{1,45}$=.296	.589
Road-unrelated positive index	$F_{1,42}$=.111	.741	$F_{1,43}$=.187	.668
Injury as a driver at fault	$F_{1,44}$=.431	.515	$F_{1,46}$=2.041	.160
Injury as a driver not at fault	$F_{1,45}$=.005	.942	$F_{1,46}$=.517	.476
Injury as a passenger	$F_{1,45}$=.612	.438	$F_{1,46}$=.004	.953
Booked for speeding	$F_{1,45}$=.256	.615	$F_{1,46}$=.790	.379
Had a crash, as a driver at fault	$F_{1,44}$=.008	.929	$F_{1,46}$=2.140	.150
Had a crash	$F_{1,44}$=.011	.918	$F_{1,46}$=.685	.412
Been booked	$F_{1,43}$=2.067	.158	$F_{1,45}$=.052	.821
Booked for doing an illegal U-turn	$F_{1,45}$=.475	.494	$F_{1,46}$=2.088	.155
Booked for running a red light	$F_{1,43}$=.173	.697	$F_{1,45}$=1.709	.305

Booked for driving with a blood alcohol content over the legal limit	$F_{1,45}$=.080	.779	$F_{1,46}$=2.609	.113
Been able to stop quickly in an emergency while driving	$F_{1,44}$=.344	.560	$F_{1,46}$=.777	.383
Variable	*Future-related versus control*		*Past-related versus control*	
Avoided a crash nearly caused by another driver	$F_{1,43}$=.004	.952	$F_{1,45}$=.357	.553
Drove safely while tired	$F_{1,43}$=1.567	.217	$F_{1,45}$=.122	.728
Been hospitalised for illness or injury	$F_{1,45}$=.151	.699	$F_{1,46}$=1.123	.295
Had pneumonia	$F_{1,44}$=.011	.916	$F_{1,46}$=4.185	.047*
Had the car you were driving stolen	$F_{1,43}$=.119	.732	$F_{1,45}$=5.131	.028*
Had gastrointestinal illness	$F_{1,43}$=.009	.923	$F_{1,45}$=1.036	.314
Had your wallet stolen	$F_{1,45}$=.002	.968	$F_{1,46}$=.196	.660
Traveled overseas	$F_{1,45}$=.039	.845	$F_{1,46}$=.401	.530
Got very good overall marks in end-of year exams at school	$F_{1,45}$=2.102	.154	$F_{1,46}$=.003	.959
b) Self-reported crash involvement	$F_{1,45}$=.586	.448	$F_{1,46}$=.965	.331

For risk taking, subjects given the future-related instructions differed significantly from control subjects in terms of exceeding the speed limit. There were no further significant effects of instruction on on-road risk-taking. In relation to trauma involvement, subjects given the past-related instructions differed significantly from control subjects in terms of "have the car you are driving stolen" and "have pneumonia". There was no further significant effect of instructions on trauma involvement. There was no instance in which the instructions had a significant effect on two variables whose association with each other was tested.

7.4.7 Comparison Of Post-Intervention Mood For Subjects Exposed To Different Instructions

The interventions may have influenced optimism bias by changing mood rather than via something more specific to their content. We assessed this possibility by assessing group differences in mood. Table 15 presents the main effects of instruction on mood.

Table 15: Main effects of instructions for the future-related versus control, and the past-related versus control, comparison, for mood, in Study 2.

Variable	*Future-related versus control*		*Past-related versus control*	
Mood				
Bored	$F_{1,43}$=.016	.899	$F_{1,37}$=.156	.695
Excited	$F_{1,43}$=.017	.896	$F_{1,37}$=1.408	.243
Relaxed	$F_{1,43}$=.996	.324	$F_{1,37}$=.444	.509
Sad	$F_{1,43}$=1.125	.295	$F_{1,37}$=.004	.951

Sociable	$F_{1,43}$=.5.88	.447	$F_{1,37}$=.407	.528

There were no significant group differences in post-intervention mood and thus the effect of the instructions on optimism bias is unlikely to have occurred via an effect on mood.

7.5 DISCUSSION

The results of Study 2 demonstrate the potential of the present instructions for reducing future- and past-related optimism bias, in addition to replicating several Study 1 findings (see also Appendix 4).

The instructions employed to reduce future-related optimism bias were somewhat effective. Subjects given these instructions demonstrated significantly lower relative risk estimates than subjects given control instructions for several road-related events and one road-unrelated event. Means were in the predicted direction for many of the remaining events. Further, subjects exposed to control instructions demonstrated optimism bias regarding "having the car you are driving stolen", "having 3 consecutive years without being booked", and "owning your own home", whereas subjects exposed to future-related instructions did not.

The instructions designed to reduce past-related optimism bias also appeared to have some impact. Relative past experience scores were significantly lower amongst subjects given the past-related instructions than amongst subjects given control instructions, for the road-unrelated negative index, injury as a driver at fault, and several further events. Means were in the predicted direction for many of the remaining events. Further, subjects exposed to control instructions demonstrated optimism bias regarding the road-unrelated negative index, "had pneumonia", and "had your wallet stolen", whereas subjects exposed to past-related instructions did not.

Instructions designed to reduce past-related optimism bias also appeared to reduce future-related optimism bias, whilst instructions designed to reduce future-related optimism bias had limited impact on past-related optimism bias. Thus, for several events relative future risk scores were significantly lower for subjects given past-related instructions than for subjects given control instructions. Further, subjects given control instructions demonstrated future-related optimism bias regarding "have the car you are driving stolen", "have a crash as a driver at fault" and "own your own home", whereas subjects given past-related instructions did not.

These data support the hypothesis that past-related optimism bias contributes to future-related optimism bias, rather than vice versa, and suggests that adding manipulation of past-related optimism bias to instructions designed to reduce future-related optimism bias may enhance their efficacy.

Interestingly, the impact of a particular set of instructions on the type of optimism bias they targeted did not appear to be greater when this type of optimism bias was assessed first. For example, the impact of the future-related instructions on future-related instructions was not significantly greater if risk estimates were made before rather than after experience ratings.

Although the instructions focussed on road-related events to a greater extent than road-unrelated events, the impact on optimism bias appears to have generalised to road-unrelated events. For example, subjects who were exposed to instructions designed to reduce past-related optimism bias had lower relative risk estimates than control subjects for the road-unrelated negative index. Thus, an intervention which reduces road-related optimism bias may have health benefits beyond the reduction of road trauma involvement.

Whilst the impact of the present instructions may appear small it is remarkable in view of the difficulty of reducing optimism bias (see Weinstein & Klein, 1995). Further, the practical impact of even a small change in optimism bias may be large.

Study 2 replicated the results of Study 1 in demonstrating road-related optimism bias regarding the future and the past.

On average subjects in the present sample believed that they are less likely than their peers to experience negative road-related events, and road-unrelated events. The observation of optimism bias regarding positive road-related and road-unrelated events suggests that these results are unlikely to be the result of a response bias.

Past-related optimism bias was also observed in the present sample. That is, on average subjects believed that they have had less past experience of negative events, and more past experience of positive events. Past-related optimism bias was observed for most indices and several events.

In sum, the instructions developed for the present study might be a useful tool in reducing optimism bias. The addition of instructions designed to reduce past-related optimism bias to instructions designed to reduce future-related optimism bias may further enhance the effectiveness of the latter instructions in reducing future-related optimism bias. In Study 3 the future-related instructions were refined (and this way, and others) and their effectiveness compared with a component of a driver training course which is used to reduce optimism bias, in driver training samples.

8 STUDY 3: EVALUATION OF INTERVENTIONS DESIGNED TO REDUCE ROAD-RELATED OPTIMISM BIAS IN A CORPORATE DRIVER TRAINING SAMPLE

We aimed to examine optimism bias in driver training samples, and to evaluate interventions designed to reduce it. One of these interventions was already in use by Corporate Driver Training Australia Ltd. (CDTA), although originally based on considerations by one of the authors (RFSJ). The other intervention was a refinement of the interventions we used with psychology students. The intervention designed to reduce optimism bias regarding the future and the intervention designed to reduce optimism bias about the past each influenced both future- and past-related optimism bias in Study 2. Thus we combined them and offered more detailed approached to avoiding optimism bias for the driver training samples.

The intervention designed in the University of Sydney Psychology Department (USYD) differed from the CDTA intervention in two main respects. First, it gives more explicit suggestions as to how to avoid optimism bias. Second, the USYD intervention emphasises the dangers of optimistically biased thinking in order to strengthen motivation to avoid it and suggests that participants abandon their faulty perceptions of low relative risk if they are to practice "low risk driving". In contrast, the CDTA intervention suggests that participants can be justified in their perceptions of low relative risk provided they practice "low risk driving". It is not clear which of these will motivate participants to change their perceptions and behaviours most strongly.

We tested the hypothesis that the CDTA intervention would reduce optimism bias relative to controls, but made no prediction as to which out of the CDTA and USYD interventions would be the most effective. Further, we evaluated the efficacy of the CDTA intervention at a 2-year follow-up (with participants who had completed the course approximately 2 years prior to the present study).

8.1 DESIGN

The CDTA intervention and the USYD intervention were each compared to controls who received no such interventions. A pre- versus post-measure design would not have been appropriate because the questionnaire which assesses optimism bias is relatively simple so even if subjects completed it at the beginning of the course, their responses in the afternoon after the optimism bias intervention would probably have been influenced by this first completion. It would not have been practical to mail-out pre-treatment questionnaires, because of difficulty obtaining addresses for participants (whose enrollment was often not confirmed until the day of the course). Further, we preferred subjects to complete the questionnaires under controlled conditions.

We aimed for a wait-list control group in order to avoid selection biases, for example of more accident-prone drivers (who thus have above average room for improvement). Rather than obtaining addresses we asked control participants to complete our questionnaires at the beginning of the course, before they had been exposed to any teaching materials. This methodology also ensured that the control group participants completed the questionnaires under controlled conditions.

The long-term impact of the CDTA intervention was evaluated by comparing the participants given the CDTA intervention with participants who were participating in a refresher course, having participated in the initial CDTA course (including the same optimism bias session as that used in the present study) approximately 2 years prior to the present study. These follow-up participants also completed the questionnaires at the beginning of the course (before receiving any teaching materials).

Treatment subjects completed the questionnaires immediately after the optimism bias intervention at approximately 4pm. Thus, these subjects had been exposed to all preceding course components at the time they completed the questionnaires. This methodology is open to the criticism that any change in optimism bias may be due to any other component of the course rather than the optimism bias intervention. However, other components of the course (e.g. in-car training) are likely to increase, rather than decrease optimism bias, so if a decrease is observed it is most likely due to the optimism bias intervention. Further, the aim is to achieve an intervention which leaves participants with reduced optimism bias at the end of the course, and thus the critical question is in fact whether the intervention in conjunction with the rest of the course reduces optimism bias.

The counterbalances of question order employed in the Optimism Bias Questionnaire in Study 2 were employed again here. Thus, approximately half of the subjects rated future likelihood before experience, and the remainder made ratings in the reversed order, to ensure an equivalent effect of the manipulation on both future- and past-related optimism bias. Further, we added a counterbalance of the order of making ratings for the self versus the average peer, because although this ratings order typically has no effect in student samples we have no relevant data for samples from the present population. Approximately half of subjects rated themselves before rating the average peer, and the remainder rated the average peer first. The resulting four versions of the questionnaire were approximately evenly distributed across groups.

Courses were mainly conducted in Sydney and Melbourne, and we aimed for each group to be evenly represented in each city. We also included participants of one course that was conducted in Brisbane, in order to maximise sample size.

8.2 METHODS

8.2.1 Participants

74 employees of companies including Orica and Shell participated in the initial driver training courses. These courses were made available by the companies, with participation optional. Generally, participants do not self select because of having a particularly poor driving record, although this may have sometimes been the case. Possible concerns with selection biases, are countered by the use of wait-list controls as a comparison group. These participants were randomly distributed to the CDTA, USYD, or control conditions.

13 employees of Orica (Sydney) participated in a refresher course to supplement the CDTA driver training course which they had completed approximately 2 years earlier. These participants provided the follow-up group.

8.2.2 Materials

Course handbook

Participants of the initial CDTA and USYD courses all received the same course handbook (although control participants completed questionnaires before going through this handbook). Participants of the CDTA refresher course had received the same handbook when they participated in the CDTA course approximately 2 years earlier, but received a slightly different handbook at the time of the present study. They also completed questionnaires before going through the current handbook.

The course handbook received by participants contained information and exercises relevant to various components of the day-long course. Only some were directly relevant to the CDTA and USYD optimism bias lessons. First, before any mention of unrealistic optimism, subjects are asked to rate their agreement with the following statements:

1. Over time I'm becoming a safer driver- compared to others I'm pretty careful.
2. I think crashes happen fairly often.
3. I have driven thousands of kilometers every year since I got my license.
4. Driving is a relatively dangerous activity
5. Inexperienced drivers crash considerably more often than experienced ones

In the "optimism bias" section, subjects are given the information:

> "An optimistic person is a person with a hopeful disposition; a person who believes that good things will happen to them rather than bad. Unrealistic optimism in high risk activities like driving is potentially dangerous. People who have an exaggerated sense of control- who are Unrealistically optimistic- tend not to be as cautious as people with realistic views"
>
> "It is well recognised that many drivers consider themselves to be of above average skill, and less likely to crash than their peers"

Wall cards

Ten A4-sized cards, each printed with a large number from 1 to 10 were affixed to the wall at approximately equal intervals. In the course of each intervention, participants were asked to go and stand beside the number corresponding to their rating for the question: "Over time I'm becoming a safer driver- compared to others I'm pretty careful".

Instruction Overheads

For both the CDTA and the USYD interventions, messages were conveyed verbally with the assistance of overheads.

The CDTA overheads identified irrational thought processes which may underlie optimism bias, with the aim of undermining them. This information was presented in the context of a conversation between two drivers, one justifying his view that he is a safer driver than his peers using arguments based on perceptions rated earlier by the participants (e.g. "I have driven thousands of kilometers every year since I got my license"), and the other pointing out logical errors in these arguments.

The USYD overheads (see Appendix 2) were based those employed in Study 2 to manipulate optimism bias about the future. Information about past-related optimism bias and approaches to avoiding it were incorporated as a technique for reducing optimism bias about the future. A range of further strategies for reducing optimism bias were offered. These were a refinement of those employed in Study 2 and were illustrated with more examples.

Questionnaires: (see Appendix 3)

The questionnaires employed in Study 3 were the same as those employed in Study 2 apart from several minor changes. First, the event "Get very good marks at university" was removed from the Optimism Bias Questionnaire, because it clearly has no relevance to the present sample. Second, "in the next/past 2 years" was added as a time frame for each optimism bias question to control for wider variation in the time participants have been driving than in the student samples. Third, in the

Demographics and Control Variables Questionnaire, the question assessing whether anyone had been killed in a crash in which the participant was involved was removed, because it may have upset participants who could answer in the affirmative, with little gain for us. The Marlowe-Crowne Social Desirability Scale, short form C (Reynolds, 1982) was replaced with the Balanced Inventory of Desirable Responding (Paulhus, 1988), which provides a scale of self-deception and impression management. Both changes to the Demographics and Control Variables questionnaire were made after data had already been collected from the follow-up participants.

Finally, we added a page appealing for participants' consent to check their driving records. If they consented they were required to provide their license number and signature. For the final few participants given the CDTA and USYD interventions, this page also sought ratings of the extent to which skills and knowledge gained from the course would be employed when driving generally, when driving and hurrying, and when driving while tired.

8.2.3 Procedure

Session time and place depended somewhat on the schedule of driver training courses. Day-long initial courses were run in Melbourne in March and July, 2000, in Sydney in February, April, June and July, 2000, and in Brisbane in June, 2000. Day-long refresher courses were held in February, 2000.

All participants were asked to complete a battery of questionnaires at some time during the day. Control and follow-up participants completed the questionnaires at the beginning of the day after only a brief and general welcome and introduction to the course. The remaining participants completed the questionnaires after the optimism bias intervention, around 4 o'clock in the afternoon. Prior to completing the questionnaires, subjects were given standardised instructions, outlining briefly (and suitably vaguely) the nature and importance of the study, and assuring them of their anonymity.

Early in the course, subjects given either the CDTA or USYD initial interventions were asked to make the ratings (outlined above)in their course handbook. Participants then completed lessons on safe driving practices (tyre care, posture, seat belt position, braking skills), understanding and defining risk, crash avoidance space, risk acceptance, and fatigue. They had an in-car session reviewing these topics. Participants were then given the optimism bias interventions.

Both interventions were administered similarly to the intervention employed in Study 2. That is, information was presented by overhead and verbally. During the lesson, participants were asked to stand next to the number (from 1-10) on the wall that corresponded to their agreement rating for the statement, "Over time I'm becoming a safer driver- compared to others I'm pretty careful". The accuracy of participants' position was discussed with the group.

After completing questionnaires participants were thanked for their co-operation and completed the remainder of the course normally.

8.3 STATISTICAL ANALYSIS

The raw data were analysed with SPSS (Statistical Package for the Social Sciences). The Type I error rate for all analyses was set at .05.

Similar analyses to those conducted in relation to Study 2 were conducted again here, with modifications to the group comparisons which were driven by the design. Some analysis conducted in relation to Study 1 but omitted in relation to Study 2 (e.g. assessing the relationship of optimism bias with on-road risk-taking) were included in relation to Study 3, because a different population was sampled.

First, we considered sample characteristics in terms of age, gender, driving exposure and tendency to conform to social expectations (including group differences).

Relative scores were calculated for each item of the Optimism Bias Questionnaire, as in previous studies. Road-related relative future likelihood negative and positive indices, road-unrelated relative future likelihood negative and positive indices, and 3 average relative future risk indices regarding accident involvement (as a driver at fault, as a driver not at fault, and as a passenger), were also computed as in Study 1. Parallel relative experience indices were also computed as in Study 1.

In order to assess the efficacy of the CDTA intervention, the optimism bias (future-related and past-related) demonstrated by participants exposed to this intervention was compared to optimism bias demonstrated by control participants, with the prediction than optimism bias would be lower in the CDTA condition. Next, the optimism bias (future-related and past-related) demonstrated by participants in the CDTA intervention was compared to optimism bias demonstrated by participants in the USYD intervention, in order to compare the efficacy of these interventions. No directional prediction was made in relation to this comparison. These comparisons were made employing a 4 factor ANOVA. The between subjects factors were "intervention" (CDTA versus control, or USYD versus control), "time order" (future risk estimates versus past experience ratings first), "ratings order" (self versus average peer first), and city (Sydney versus Melbourne versus Brisbane).

In order to assess the long-term efficacy of the CDTA intervention, the optimism bias (future-related and past-related) demonstrated by participants in given the initial CDTA intervention was compared to optimism bias demonstrated by the follow-up participants, only for variables which demonstrated a significant difference between the CDTA and control conditions. This comparison was made employing a 3 factor ANOVA. The between subjects factors were "session" (post-course versus follow-up), "time order" (future risk estimates versus past experience ratings first), "ratings order" (self versus average peer first).

The use of ANOVAs allowed for consideration of the main effect of "intervention", as well as interactions with the counterbalances. If intervention had a significant main effect optimism bias was assessed for each level of that factor separately.

Optimism bias was assessed by comparing relative index and event scores to the score representing no difference between self and peers (0) using a 1-tailed single sample t-test. A sample average which is significantly greater than 0 reflects optimism bias.

The relative sizes of future- versus past-related optimism bias were compared employing a repeated measures t-test. Past-related optimism bias was expected to be greater on the basis of previous findings.

Similarly, a repeated measures t-test was employed to compare the relative sizes of optimism bias regarding road-related versus road-unrelated events.

The hypothesis that optimism bias regarding the past contributes to optimism bias regarding the future was assessed by evaluating the correlation of relative future likelihood indices and events with corresponding relative experience indices and events. Significant positive correlations would provide evidence consistent with the hypothesis.

A general on-road risk-taking index was computed by adding all items form the On-road Risk Taking Questionnaire which were phrased in negative terms, and subtracting those which were phrased in positive terms.

The instruction conditions were compared in terms of risk taking and involvement in road (and other) trauma (as well as other variables employed in later analysis) employing ANOVAs structured as outlined above. Correlations between any two variables which demonstrated a main effect of "instruction" were computed within each level of that factor, in order to avoid spurious correlations.

The relationship of optimism bias regarding future and past road use with risk-taking on the road was evaluated by assessing the correlation of relative future likelihood estimates and relative experience estimates with a general index of on-road risk-taking behaviour. The relationship of

optimism bias regarding specific road-related events (e.g. being booked for speeding) with corresponding on-road risk-taking behaviours (e.g. speeding) was also assessed. Although most significant correlations in Study 1 were consistent with the view that risk-perception influences optimism bias rather than vice versa, we were reluctant to adopt 1-tailed tests. Significant effects in the opposite direction were also observed, and may be important.

The relationship of optimism bias regarding future and past road use with involvement in road trauma was evaluated by assessing the correlation of relative future likelihood estimates with estimates of personal experience of road trauma from the Optimism Bias Questionnaire, as well as the crash involvement item from the Demographic and Control Variables Questionnaire. For relative past experience scores only the relationship with crash involvement was assessed (due to the mathematical dependence of the personal and relative experience scales). Again, two-tailed tests were employed.

The relative sizes of correlations with on-road risk-taking and involvement in road (and other) trauma of future- versus past-related optimism bias were compared employing a Fisher's z-test.

Correlations of personal future risk estimates with on-road risk-taking and with involvement in road (and other) trauma were also computed, and their size compared to the corresponding correlations for future-related optimism bias employing a Fisher's z-test.

The proposition that on-road risk-taking contributes to road trauma is evaluated by assessing the correlation between indices of on-road risk-taking and road-trauma involvement. Positive relationships were expected.

Finally, we assessed the impact of demographic variables (e.g. age, gender), driving experience (e.g. number of years licensed, average hours spent driving per week) and social desirability on risk perception, on-road risk-taking and involvement in road (and other) trauma. Correlations were employed to assess the relationship between two continuous variables, whereas independent samples t-tests were employed to assess the relationship of continuous variables with dichotomous variables (e.g. gender).

8.4 RESULTS

8.4.1 Sample Characteristics

CDTA participants did not differ in terms of age, or number of years licensed compared to control participants ($F_{1,31}$=2.567, p=.119; $F_{1,31}$=2.756, p=.107, respectively), USYD participants ($F_{1,46}$=1.703, p=.198; $F_{1,46}$=2.077, p=.156, respectively), or follow-up participants ($F_{1,32}$=1.332, p=.257; $F_{1,32}$=1.778, p=.192, respectively). There was also no significant difference in gender between the groups (CDTA vs control: χ^2=.028, p=.867; CDTA vs USYD: χ^2=.088, p=.766; CDTA vs follow-up; χ^2=.1.129, p=.569). The groups did not differ in terms of self deception (CDTA vs control: $F_{1,31}$=.467, p=.500; CDTA vs USYD: $F_{1,46}$=.966, p=.331; CDTA vs follow-up; different scale employed) or impression management (CDTA vs control: $F_{1,31}$=.510, p=.480; CDTA vs USYD: $F_{1,46}$=.053, p=.819; CDTA vs follow-up; different scale employed).

On average, CDTA participants spent significantly more hours driving per week than control or follow-up participants ($F_{1,31}$=5.559, p=.025, $F_{1,32}$=4.311, p=.046, respectively). There was no difference between CDTA and USYD participants in terms of the number of hours spent driving each week ($F_{1,46}$=.910, p=.345). The number of hours spent driving each week did not correlate significantly with optimism bias, on-road risk-taking or involvement in road (and other) trauma (highest nonsignificant r=.221, n=74, p=.058), and thus this group difference was not considered in further analysis.

8.4.2 Optimism Bias Regarding Various Aspects Of Future Road Use For CDTA Participants Compared To Control, USYD, Or Follow-Up Participants

Figure 9 presents mean relative future risk scores for each index (with S.E.M. bars), for control participants, CDTA participants and USYD participants.

Relative future risk scores of CDTA participants did not differ significantly from the relative future risk scores of control participants for any of the road-related or road-unrelated, negative or positive indices (highest $F_{1,27}$=2.341, p=.069), although scores means were in the predicted direction for all variables except the road-unrelated positive index for which means were equal.

Relative future risk scores were significantly lower for CDTA participants compared to control participants for 2 of 11 road-related negative events ("Be killed in a crash, as a driver at fault": $F_{1,31}$=3.608, p=.034; "Be killed in a crash as a passenger": $F_{1,30}$=3.440, p=.067), and 1 of 5 road-related positive events ("Have 2 consecutive years without being booked": $F_{1,31}$=3.382, p=.038). Only one significant effect of the instructions on road-unrelated negative or positive events was observed (for "Have gastrointestinal illness": $F_{1,30}$=4.611, p=.020). Means were in the predicted direction for a further 8 road-related negative events, 4 road-related positive events, 3 road-unrelated negative, and 2 road-unrelated positive events.

The interaction of intervention (CDTA versus control) with time order was significant for the road related positive index ($F_{1,27}$=5.060, p=.033), "have 2 consecutive years of crash-free driving" ($F_{1,30}$=5.704, p=.023), "drive safely while tired" ($F_{1,30}$=4.357, p=.045), as well as the road-unrelated negative index ($F_{1,27}$=5.290, p=.029). For the road-related index and events, relative future risk scores were significantly lower for CDTA participants than for control participants if future risk was rated before relative experience (t_{22}=2.74, p=.006, t_{22}=2.14, p=.022, t_{22}=2.35, p=.014, respectively), but not if ratings were made in the opposite order Relative future risk scores of CDTA participants did not differ significantly from the relative future risk scores of control participants for any of the road-related or road-unrelated, negative or positive indices (highest $F_{1,27}$=2.341, p=.069), although scores means were in the predicted direction for all variables except the road-unrelated positive index for which means were equal.

Relative future risk scores were significantly lower for CDTA participants compared to control participants for 2 of 11 road-related negative events ("Be killed in a crash, as a driver at fault": $F_{1,31}$=3.608, p=.034; "Be killed in a crash as a passenger": $F_{1,30}$=3.440, p=.067), and 1 of 5 road-related positive events ("Have 2 consecutive years without being booked": $F_{1,31}$=3.382, p=.038). Only one significant effect of the instructions on road-unrelated negative or positive events was observed (for "Have gastrointestinal illness": $F_{1,30}$=4.611, p=.020). Means were in the predicted direction for a further 8 road-related negative events, 4 road-related positive events, 3 road-unrelated negative, and 2 road-unrelated positive events.

The interaction of intervention (CDTA versus control) with time order was significant for the road related positive index ($F_{1,27}$=5.060, p=.033), "have 2 consecutive years of crash-free driving" ($F_{1,30}$=5.704, p=.023), "drive safely while tired" ($F_{1,30}$=4.357, p=.045), as well as the road-unrelated negative index ($F_{1,27}$=5.290, p=.029). For the road-related index and events, relative future risk scores were significantly lower for CDTA participants than for control participants if future risk was rated before relative experience (t_{22}=2.74, p=.006, t_{22}=2.14, p=.022, t_{22}=2.35, p=.014, respectively), but not if ratings were made in the opposite order (means in a direction inconsistent with predictions in each case). For the road-unrelated negative index CDTA participants did not differ from control participants regardless of time order (means in a direction inconsistent with predictions in each case).

Relative future risk scores for USYD participants were significantly lower than those for CDTA participants for the road-related positive index ($F_{1,41}$=4.227, p=.046). Relative future risk scores for

CDTA participants did not differ significantly from those for USYD participants for any further road-related or road-unrelated, negative or positive indices (highest nonsignificant $F_{1,41}=2.507$, $p=.121$), although means were (nonsignificantly) lower for USYD participants only in the case of the road-unrelated positive index.

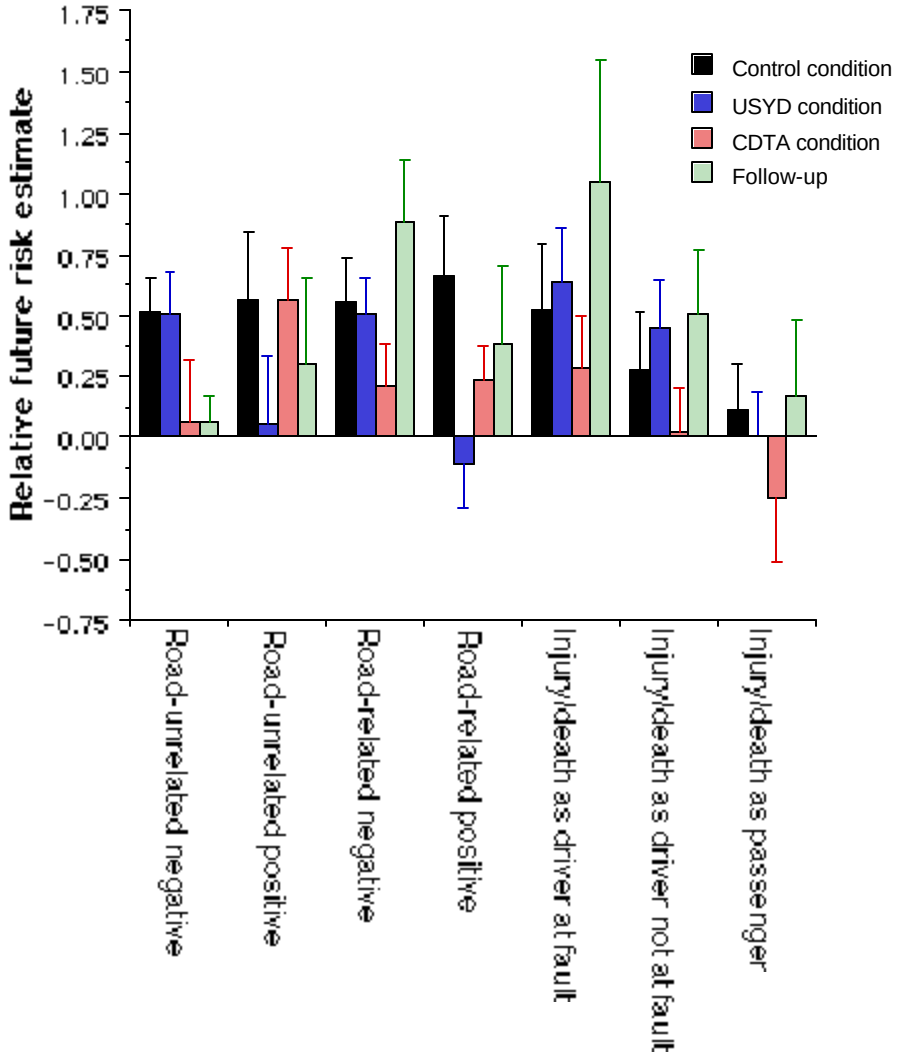
Relative future risk scores were significantly greater for USYD participants compared to CDTA participants for "Be killed in a crash as a driver at fault" ($F_{1,46}=5.804$, $p=.020$), and significantly lower for "Avoid a crash nearly caused by another driver" ($F_{1,44}=6.249$, $p=.016$). Means were nonsignificantly lower for USYD participants for 5 road-related negative events, 1 road-related positive event, 1 road-unrelated negative event, and 1 road-unrelated positive event.

The interaction between intervention (CDTA versus USYD) and time order, estimate order or city could not be computed.

CDTA participants and follow-up participants were compared for indices and events for which CDTA participants differed significantly from control participants. CDTA did not differ significantly from follow-up participants in relation to "be killed in a crash as a driver at fault", "be killed in a crash as a passenger", "have 2 consecutive years without being booked", or "have gastrointestinal illness" ($F_{1,32}=1.936$, $p=.174$, $F_{1,31}=.736$, $p=.398$, $F_{1,32}=.747$, $p=.394$, $F_{1,31}=.160$, $p=.692$).

Thus the CDTA intervention seems to have some efficacy in reducing future-related optimism bias, which persists for up to 2 years. The CDTA and USYD interventions appear to be roughly equally effective.

Figure 9: Mean relative future risk for the road-related negative, road-related positive, road-unrelated negative and road-unrelated positive indices, and the index regarding injury/death as a driver at fault, as a driver not at fault, and as a passenger, for control, USYD, CDTA and follow-up participants, in Study 3.



8.4.3 Optimism Bias Regarding Various Aspects Of Future Road Use

Relative future risk scores were significantly greater than zero for the road-related negative index (t_{81}=5.40, p<.001, t_{72}=4.36, p<.001, respectively), and for the road-unrelated negative and positive indices (t_{84}=3.21, p=.001, t_{85}=2.63, p=.005). Optimism bias was also demonstrated for crash involvement as a driver at fault (t_{85}=4.12, p<.001) and as a driver not at fault (t_{85}=2.62, p=.050), but not as a passenger (mean in the direction opposite to prediction and thus nonsignificant according to the 1-tailed test employed).

Optimism bias for the road-related positive index was tested separately in each group, because of a main effect of group. Significant optimism bias was demonstrated in the control group (t_{21}=2.80, p=.006), but not in the CDTA (t_{24}=1.67, p=.054) or the USYD groups (mean in a direction inconsistent with optimism bias and thus nonsignificant according to the 1-tailed test employed).

Relative future risk scores were significantly greater than zero for 8 of 9 road-related negative events (lowest significant t_{85}=5.89, p<.001; excluding 2 events tested separately by group), 1 of 3 road-related positive events (t_{85}=3.43, p=.001; excluding 2 events tested separately by group), 2 of 3 road-unrelated negative events (highest t_{84}=2.87, p=.003; excluding 1 event tested separately by group), and 1 of 3 road-unrelated positive events (t_{85}=4.05, p<.001). No event demonstrated relative scores lower than zero (and thus nonsignificant according to the 1-tailed test employed).

Several events were tested separately by group because of significant main effects of instructions. Optimism bias was observed in the control condition, but neither the USYD, CDTA or follow-up conditions, for "have 2 consecutive years without being booked" (t_{21}=2.97, p=.004, t_{26}=.19, p=.427, t_{24}=.16, p=.439, t_{11}=1.24, p=.121, respectively), and for "have gastrointestinal illness" (t_{21}=4.12, p<.001, t_{26}=1.68, p=.053, t_{24}=.14, p=.444, mean in a direction inconsistent with optimism bias, respectively). Optimism bias was observed in the control and the USYD conditions, but not the CDTA or follow-up conditions for "be killed in a crash as a driver at fault" (t_{21}=2.05, p=.027, t_{26}=3.43, p=.001, t_{24}=.00, p=.500, t_{11}=1.24, p=.121, respectively). Optimism bias was observed in no condition for "be killed in a crash as a passenger" (control: t_{21}=.76, p=.230; CDTA: t_{23}=1.44, p=.082; USYD and follow-up: mean in a direction inconsistent with optimism bias), and in the CDTA condition only for "avoid a crash nearly caused by another driver (t_{24}=1.88, p=.037; control: t_{21}=1.16, p=.131; USYD and follow-up: mean in a direction inconsistent with optimism bias).

These findings further suggest that the CDTA and USYD interventions reduced future-related optimism bias, at least for some events, and were about equally effective.

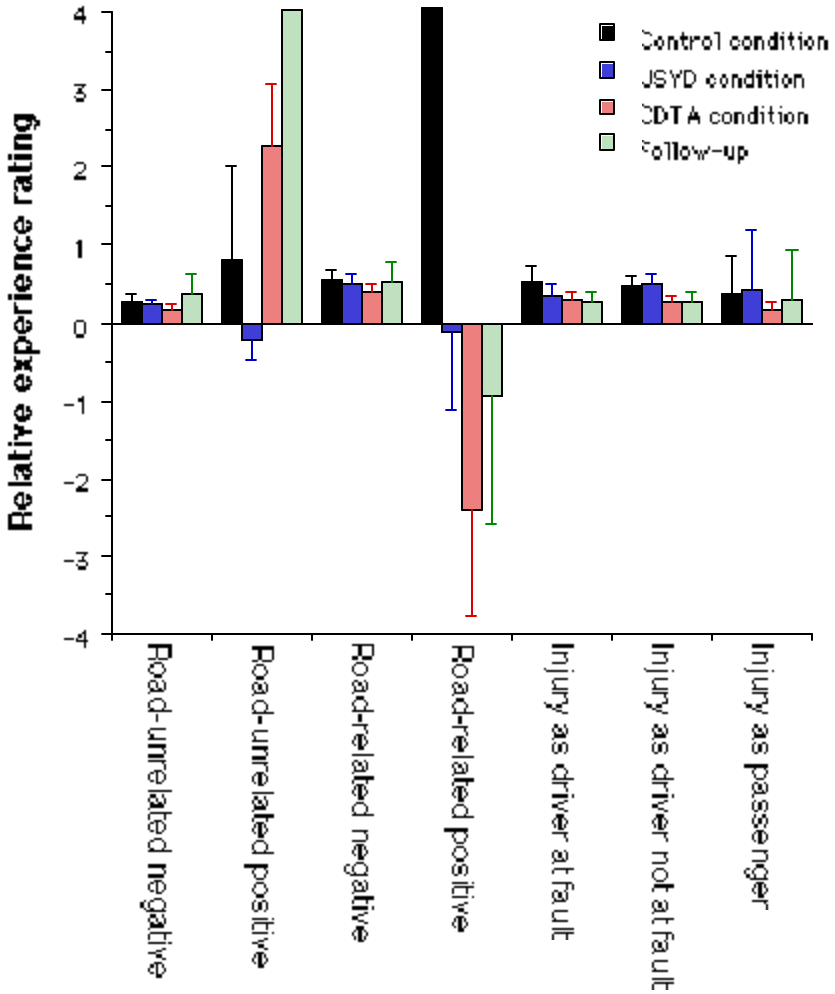
8.4.4 Optimism Bias Regarding Various Aspects Of Past Road Use For CDTA Participants Compared To Control, USYD, Or Follow-Up Participants

Figure 10 presents mean relative past experience scores for each index (with S.E.M. bars), for control participants, CDTA participants and USYD participants.

Relative past experience scores of CDTA participants did not differ significantly from the relative past experience scores of control participants for any of the road-related or road-unrelated, negative or positive indices (highest nonsignificant $F_{1,27}$=2.341, p=.069), although scores means were in the predicted direction for all variables except the road-unrelated positive index (means in the direction opposite to prediction).

CDTA and control participants did not differ in terms of relative past experience for any negative or positive, road-related or road-unrelated events (highest nonsignificant $F_{1,27}$=2.663, p=.057). Means were in the predicted direction for 1 road-related negative event, 3 road-related positive events, 4 road-unrelated negative events, and 1 road-unrelated positive event.

Figure 10: Mean relative past experience for the road-related negative, road-related positive, road-unrelated negative and road-unrelated positive indices, and the index regarding injury as a driver at fault, as a driver not at fault, and as a passenger, for control, USYD, CDTA, and follow-up participants, in Study 3 (t= "truncated").



The interaction of treatment (CDTA versus control) with time order was significant for 6 events (lowest significant $F_{1,27}$=2.341, p=.069), and the interaction of treatment (CDTA versus control) with estimate order was significant for 3 events (lowest signific ant $F_{1,27}$=2.341, p=.069). For "had a crash as a driver at fault", "injured in a crash as a driver at fault", "had a crash", "injured in a crash as a driver not at fault", "had the car you were driving stolen", and "had gastrointestinal illness" CDTA participants had significantly lower relative experience scores than control participants if future risk was rated before past experience (lowest significant t_{22}=3.37, p=.002), but not if ratings were made in the opposite order (means in a direction inconsistent with prediction for each event except "had the car you were driving stolen": t_{21}=.60, p=.277). For "been hospitalised for illness or injury", "had a crash as a driver at fault", "injured in a crash as a driver at fault" relative experience scores were lower for CDTA participants than for control participants if subjects rated the average peer before themselves (t_{21}=2.25, p=.019, t_{21}=2.61, p=.008, t_{21}=1.84, p=.040), but not if estimates were made in the opposite order (means in a direction inconsistent with prediction for each event).

Relative past experience scores were significantly lower for USYD participants compared to CDTA participants for the road-unrelated positive index ($F_{1,42}$=6.548, p=.014). Scores did not differ for the two interventions for the remaining road-related and road-unrelated, negative and positive indices (highest nonsignificant $F_{1,44}$=1.912, p=.174). However, scores were (nonsignificantly) lower for CDTA than for USYD participants for all remaining indices.

Relative past experience scores for USYD participants were significantly lower than for CDTA participants for "Traveled overseas" ($F_{1,42}$=6.548, p=.014), and significantly greater for "Had their wallet stolen" ($F_{1,44}$=4.765, p=.034). Past experience scores were nonsignificantly lower for CDTA participants for 9 road-related negative events, 1 road-related positive event, and 3 road-unrelated negative events.

The interaction of intervention (CDTA versus USYD) with time order, estimate order and city could not be computed.

Because CDTA participants did not significantly from control participants for any relative experience indices or events, no comparisons of CDTA participants and follow-up participants were compared in relation to relative experience.

Thus, the CDTA intervention was somewhat effective in reducing past-related optimism bias (being effective only under some circumstances), and was about as effective as the USYD intervention.

8.4.5 Optimism Bias Regarding Various Aspects Of Past Road Use

Relative past experience scores were significantly greater than zero for the road-related negative index (t_{81}=7.69, p<.001; road-related positive index: t_{79}=.54, p=.297). Past-related optimism bias was also demonstrated for crash involvement as a driver at fault (t_{83}=5.26, p<.001), as a driver not at fault (t_{83}=6.65, p<.001), and as a passenger (t_{83}=5.39, p<.001). For the road-unrelated positive index, which demonstrated significant differences between the USYD and CDTA participants, optimism bias was observed in the CDTA condition only (t_{25}=4.93, p<.001; control: t_{20}=.70, p=.248; USYD: mean in a direction inconsistent with optimism bias).

Relative past experience scores were significantly greater than zero for each of 10 road-related negative events (lowest significant t_{83}=4.85, p<.001), none of 3 road-related positive events (highest nonsignificant t_{81}=.85, p=.199), 2 of 3 road-unrelated negative events (t_{83}=3.30, p=.001; excluding 2 events tested separately by group). All events demonstrated relative scores greater than zero.

Several events were tested separately by group because of significant differences between groups. Past-related optimism bias was observed in the control and CDTA conditions (t_{21}=3.20, p=.001, t_{24}=3.01, p=.003, respectively), but not the USYD condition (t_{24}=.77, p=.225) for "had the car you were driving stolen". Past-related optimism bias was observed in the CDTA condition only for "traveled overseas" (t_{23}=2.80, p=.005; control: t_{20}=.70, p=.248; USYD: mean in a direction inconsistent with optimism bias). Optimism bias was observed in the USYD condition only for "had your wallet stolen" (t_{24}=3.18, p=.002; control: t_{21}=3.38, p=.002; CDTA: t_{24}=2.40, p=.013).

8.4.6 Comparison Of Road-Related Versus Road-Unrelated Optimism Bias, In Relation To The Future And The Past

Road-related and road-unrelated events did not differ significantly in terms of relative future risk score for the negative or positive indices (t_{80}=1.79, p=.077, t_{84}=.51, p=.614).

Relative past experience scores were significantly greater for the road-related than for the road-unrelated negative index (t_{81}=4.32, p<.001). No significant difference was observed between the positive indices (t_{78}=.65, p=.519), for which means were in the opposite direction.

8.4.7 Comparison Of Optimism Bias Regarding The Future Versus Optimism Bias Regarding The Past

Relative past experience scores were significantly greater than relative future risk scores only for crash involvement as a passenger (t_{82}=2.85, p=.003), although means were in the predicted direction for 4 further indices (highest nonsignificant t_{81}=1.19, p=.120).

8.4.8 The Relationship Of Optimism Bias Regarding The Past With Optimism Bias Regarding The Future

Table 16: Correlations between corresponding relative future risk and relative past experience indices (with n- and p-values), in Study 3.

	r	*n*	*p*
Road-related negative index	.242	78	.017*
Road-related positive index	-.034	79	ns
Road-unrelated negative index	.071	82	.262
Road-unrelated positive index	.133	82	.127
Crash as driver at fault	.144	84	.097
Crash as driver not at fault	.135	84	.110
Crash as passenger	.096	83	.193

ns= correlation in the direction opposite to prediction, and thus not significant

Relative past experience scores were significantly and positively correlated with relative future risk scores only for the road-related negative index. For the all remaining indices, except the road-related positive index, the correlation between future- and past-related optimism bias was positive but not significant.

Relative past experience scores were significantly positively correlated with relative future risk scores for 3 of the 10 road-related negative events (lowest significant r=.201, n=84, p=.033), and no further events. Correlations were positive but nonsignificant for a further 5 negative road related events, 1 of 3 positive road-related events, 2 of 5 negative road-unrelated events, and the positive event.

Thus, again there is evidence for a causal connection between past- and future-related optimism bias

8.4.9 Comparison Of Scores On Other Reported Variables For CDTA Participants Compared To Control, USYD, Or Follow-Up Participants

Table 17 presents the main effects of intervention for all remaining variables employed in analysis.

Table 17: Main effects of instructions for the CDTA versus control, and CDTA versus USYD, comparison, for all variables employed in later analysis, in Study 3.

Variable	*CDTA vs control*		*CDTA vs USYD*	
On-road risk-taking				

Total index	$F_{1,28}$=.773	.387	$F_{1,43}$=.007	.933
Crash as a driver index	$F_{1,29}$=1.319	.260	$F_{1,43}$=.005	.946
Impairment index	$F_{1,29}$=.110	.743	$F_{1,43}$=2.280	.138
Booked index	$F_{1,28}$=1.042	.316	$F_{1,43}$=.221	.641
Run a red light	$F_{1,30}$=.518	.477	$F_{1,45}$=.716	.402
Keep driving even though you are very tired	$F_{1,30}$=.179	.675	$F_{1,44}$=.896	.349
Do an illegal U-turn	$F_{1,30}$=.646	.428	$F_{1,44}$=.274	.604
Drive with a blood alcohol content above the legal limit	$F_{1,30}$=.000	1.000	$F_{1,44}$=1.235	.272
Travel as a passenger of a driver with a blood alcohol content above the legal limit	$F_{1,29}$=.139	.712	$F_{1,43}$=.699	.408
Exceed the speed limit by no more than 15km/hr	$F_{1,30}$=1.209	.280	$F_{1,45}$=.236	.630
Wear a seatbelt	$F_{1,30}$=.117	.735	$F_{1,45}$=.110	.742
Trauma involvement				
a) Personal experience				
Road-related negative index	$F_{1,29}$=7.571	.010*	$F_{1,44}$=4.358	.043*
Road-related positive index	$F_{1,29}$=.236	.631	$F_{1,44}$=.454	.504
Road-unrelated negative index	$F_{1,29}$=.115	.737	$F_{1,44}$=.282	.598
Road-unrelated positive index	$F_{1,29}$=.468	.499	$F_{1,44}$=5.208	.027*
Injury as a driver at fault	missing	missing	$F_{1,45}$=2.622	.112
Injury as a driver not at fault	$F_{1,31}$=.413	.525	$F_{1,44}$=2.932	.094
Injury as a passenger	$F_{1,30}$=.395	.535	$F_{1,44}$=2.820	.100
Crash as a driver index	$F_{1,29}$=8.148	.008*	$F_{1,44}$=1.712	.198
Impairment index	$F_{1,29}$=.244	.625	$F_{1,44}$=.820	.370
Booked for speeding	$F_{1,31}$=2.979	.094	$F_{1,44}$=.053	.819
Had a crash, as a driver at fault	$F_{1,29}$=.254	.618	$F_{1,45}$=.047	.829
Had a crash	$F_{1,29}$=1.971	.171	$F_{1,45}$=3.921	.054
Been booked	$F_{1,29}$=9.429	.005*	$F_{1,44}$=1.518	.043*
Booked for doing an illegal U-turn	missing	missing	$F_{1,44}$=1.524	.223
Booked for running a red light	missing	missing	$F_{1,44}$=1.848	.181
Booked for driving with a blood alcohol content over the legal limit	missing	missing	$F_{1,45}$=1.551	.219
Been able to stop quickly in an emergency while driving	$F_{1,29}$=.718	.404	$F_{1,45}$=.008	.930
Avoided a crash nearly caused by another driver	$F_{1,29}$=.039	.844	$F_{1,44}$=.837	.365
Drove safely while tired	$F_{1,29}$=.036	.851	$F_{1,44}$=1.911	.174
Been hospitalised for illness or injury	$F_{1,30}$=40.026	<.001**	$F_{1,45}$=2.708	.224
Had pneumonia	$F_{1,29}$=.377	.544	$F_{1,45}$=1.521	.224
Variable	*CDTA vs*	*control*	*CDTA vs*	*USYD*
Had the car you were driving stolen	$F_{1,31}$=13.277	.001*	$F_{1,44}$=3.218	.080
Had gastrointestinal illness	$F_{1,29}$=.914	.347	$F_{1,44}$=.143	.707
Had your wallet stolen	$F_{1,29}$=.108	.745	$F_{1,44}$=.026	.874

Traveled overseas	$F_{1,30}$=.534	.471	$F_{1,44}$=5.311	.026*
b) Self-reported crash involvement	$F_{1,31}$=.067	.797	$F_{1,46}$=2.191	.146
Relative future risk				
Crash as a driver index	$F_{1,29}$=.549	.465	$F_{1,43}$=.194	.146
Impairment index	$F_{1,29}$=.197	.660	$F_{1,43}$=3.778	.058
Relative experience				
Crash as a driver index	$F_{1,29}$=1.173	.243	$F_{1,43}$=.253	.618
Impairment index	$F_{1,29}$=1.173	.288	$F_{1,43}$=.235	.628
Personal future risk				
Road-related negative index	$F_{1,30}$=.796	.379	$F_{1,45}$=.044	.835
Road-related positive index	$F_{1,31}$=1.234	.275	$F_{1,45}$=.045	.833
Road-unrelated negative index	$F_{1,31}$=.083	.774	$F_{1,45}$=.107	.745
Road-unrelated positive index	$F_{1,30}$=.279	.601	$F_{1,45}$=.002	.967
Injury as a driver at fault	$F_{1,31}$=.267	.609	$F_{1,45}$=.009	.924
Injury as a driver not at fault	$F_{1,30}$=1.995	.108	$F_{1,45}$=.000	.997
Injury as a passenger	$F_{1,30}$=8.725	.006*	$F_{1,45}$=1.883	.176
Crash as a driver index	$F_{1,31}$=.019	.890	$F_{1,45}$=.135	.715
Impairment index	$F_{1,31}$=.738	.397	$F_{1,45}$=1.262	.267
Be booked for speeding	$F_{1,28}$=.309	.583	$F_{1,45}$=.357	.537
Have a crash, as a driver at fault	$F_{1,31}$=.209	.651	$F_{1,46}$=1.061	.308
Be injured in a crash, as a driver at fault	$F_{1,31}$=.458	.504	$F_{1,46}$=.026	.874
Be killed in a crash, as a driver at fault	$F_{1,31}$=.092	.763	$F_{1,46}$=.444	.509
Be booked for doing an illegal U-turn	$F_{1,28}$=.032	.860	$F_{1,43}$=.035	.852
Be injured in a crash, as a driver not at fault	$F_{1,31}$=.742	.396	$F_{1,45}$=.341	.562
Be killed in a crash, as a driver not at fault	$F_{1,31}$=3.916	.057	$F_{1,46}$=.245	.623
Be booked for running a red light	$F_{1,31}$=.029	.866	$F_{1,46}$=.008	.931
Be injured in a crash, as a passenger	$F_{1,31}$=10.295	.003*	$F_{1,46}$=.511	.478
Be killed in a crash, as a passenger	$F_{1,31}$=5.560	.025*	$F_{1,45}$=2.072	.157
Be booked for driving with a blood alcohol content over the legal limit	$F_{1,31}$=.150	.701	$F_{1,45}$=.002	.965
Be able to stop quickly in an emergency while driving	$F_{1,31}$=2.362	.134	$F_{1,46}$=.533	.469
Have 2 consecutive years of crash-free driving	$F_{1,31}$=.001	.970	$F_{1,44}$=.029	.866

Variable	*CDTA vs control*		*CDTA vs USYD*	
Have 2 consecutive years without being booked	$F_{1,28}$=.053	.819	$F_{1,43}$=1.285	.263
Avoid a crash nearly caused by another driver	$F_{1,31}$=.058	.812	$F_{1,45}$=6.411	.015*
Drive safely while tired	$F_{1,31}$=3.646	.066	$F_{1,45}$=.016	.900
Have pneumonia	$F_{1,31}$=.298	.589	$F_{1,46}$=.376	.543
Have the car you are driving stolen	$F_{1,31}$=1.278	.267	$F_{1,45}$=.000	.995
Have gastrointestinal illness	$F_{1,31}$=.023	.881	$F_{1,46}$=.015	.902
Have your wallet stolen	$F_{1,31}$=1.832	.186	$F_{1,46}$=.134	.716
Not be hospitalised in the next 5 years for illness or injury	$F_{1,31}$=1.593	.216	$F_{1,46}$=.138	.712
Travel overseas in the next 5 years	$F_{1,31}$=.071	.792	$F_{1,45}$=.040	.842
Own your own home	$F_{1,31}$=.004	.948	$F_{1,45}$=1.364	.249

The groups were observed to differ significantly for several personal experience variables. This may reflect an impact of the manipulation on recall. A number of significant effects were also observed for personal future risk. Thus, the impact of the intervention may occur at least in part via an impact on perceptions of personal (rather than average) risk. For those events showing a difference between the CDTA and control conditions, no significant differences between the CDTA and follow-up groups were observed (highest nonsignificant $F_{1,33}$=2.375, p=.133). There was only one instance in which the instructions had a significant effect on two variables whose association with each other was tested. Thus, the association between relative future risk and personal experience of "having the car you are driving stolen" was tested separately by group.

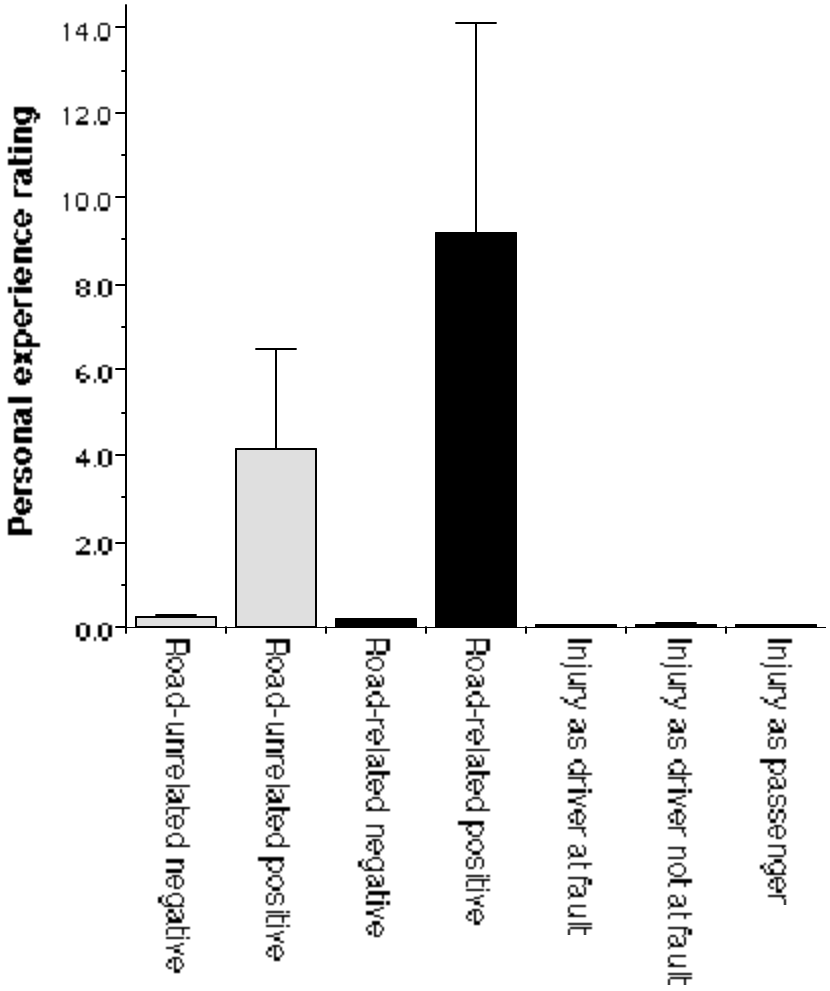
8.4.10 Mean Self-Reported Risk-Taking On The Road And Self-Reported Involvement In Road (And Other) Trauma

Consideration of "baseline" levels of on-road risk-taking and involvement in road (and other) trauma was based on data for all groups except the follow-up group, whose behaviour is likely to have been influenced by their earlier participation in the initial CDTA course.

On average, subjects reported "never" driving with a BAC above the legal limit, or driving under the influence of legal or illegal drugs which might impair their driving. They "frequently" reduce their usual speed when it is raining, and nearly always wear seatbelts. They reported "hardly ever" running red lights, changing lanes without checking, or travelling as the passenger of a driver with a BAC above the legal limit. They reported driving when tired, doing illegal U-turns, turning right when there is a small chance of collision, and exceeding the speed limit only "occasionally". On average they "occasionally" stop to talk on their mobile phone.

Subjects had had 1 crash as a driver on average. Figure 11 presents mean ratings for the personal experience indices

Figure 11: Mean personal experience for the road-related negative, road-related positive, road-unrelated negative and road-unrelated positive indices, and the index regarding injury/death as a driver at fault, as a driver not at fault, and as a passenger, for all participants, in Study 3.



Thus, participants generally report being fairly safe drivers.

8.4.11 The Relationship Of Optimism Bias Regarding The Future With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

Table 18 presents correlations of the relative future risk indices with an average on-road risk-taking index, with corresponding personal experience indices, and with self-reported crash involvement (from the Demographic and Control Variables Questionnaire).

Table 18: Correlations of relative future risk with the on-road risk-taking index, corresponding personal past experience indices, and self-reported crash involvement (with n- and p-values), in Study 3.

	On-road risk-taking index	*Corresponding personal experience index*	*Crash involvement*
Road-related negative index	-.247 (78) .029*	-.023 (80) .841	-.204 (82) .066
Road-related positive index	-.064 (80) .575	-.042 (80) .710	-.155 (85) .158
Road-unrelated negative index	.006 (80) .955	-.086 (83) .441	-.140 (85) .200
Road-unrelated positive index	-.162 (81) .149	.117 (85) .285	.108 (86) .325
Crash as driver at fault	.010 (81) .933	-.009 (86) .936	-.106 (86) .333
Crash as driver not at fault	-.206 (81) .065	.026 (85) .815	-.130 (86) .232
Crash as passenger	-.337 (81) .002*	-.023 (84) .835	-.009 (85) .938

The on-road risk-taking index correlated significantly and negatively with the negative road-unrelated index, and with relative risk of having "a crash as a passenger". Three further correlations were negative (but nonsignificant), and the p-value was low for "crash as a driver not at fault".

There were no significant correlations between optimism bias and involvement in road (and other) trauma, although 11 of 14 correlations were negative (but nonsignificant), and the low p-value for the negative correlation between the road-related negative index and the number of previous crashes was low (.066).

The relationship between personal past experience and relative future risk of "been booked in the last 2 years" was assessed for each group separately, because of main effects of group. No significant correlation was observed amongst subjects exposed to the control, CDTA or USYD conditions (r=-.145, n=22, p=.520; r=-.391, n=25, p=.054; r=.293, n=27, r=.138, respectively). Relative future risk scores were significantly negatively correlated with personal experience scores for "have gastrointestinal illness" (r=-.278, n=84, p=.010). Ten further correlations were in a direction suggesting that less experience of negative events, and more experience of positive events, promotes optimism bias.

Two further road-related relative future risk indices were computed by averaging scores for 4 events which involve crashing as a driver (4, 7, 8, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &16). Corresponding on-road risk-taking indices were computed by averaging scores for behaviours which are likely to contribute to having a crash as a driver (1, 2, 3, 4, 5, 6, 7, 8, 11, 12, & 13), and by averaging scores for behaviours which contribute

to impairment (2, 6, 7, & 8). Finally, an average on-road risk-taking index was computed by averaging scores for behaviours which contribute to being booked (1, 3, 6, 10, & 13).

Correlations were then computed between the corresponding road-related relative future risk and on-road risk-taking indices, and between the relative future likelihood of having 2 consecutive years of not being booked and the average index of behaviours which contribute to the likelihood of being booked. We also computed correlations of the relative future risk scores for being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The correlations of self-reported frequency of driving when tired with the relative future likelihood of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with the relative future risk of crash involvement as a passenger, were also computed. These "focussed" correlations are presented in Table 19.

Table 19: Correlations of specific road-related relative future risk indices and events, with self-reported frequency of performing corresponding on-road risk-taking behaviours (with n- and p-values), in Study 3.

	r	*n*	*p*
Crash involvement as a driver index	.016	80	.890
Impairment index	-.206	85	.059
2 consecutive years without being booked	-.085	84	.443
Booked for speeding	-.109	85	.323
Booked for doing an illegal U-turn	-.128	83	.249
Booked for running a red light	-.108	86	.324
Booked for driving with a BAC over the legal limit	-.117	86	.282
Driving safely while tired	-.055	86	.614
Crash involvement as a passenger	-.055	85	.620

No significant correlation was observed, although 8 of 9 correlations were in the direction consistent with the claim that more frequent performance of risky behaviours reduces optimism bias, and for the correlation of optimism bias regarding events which are likely to be influenced by impairment with behaviours which contribute to impairment the p-value was low.

8.4.12 The Relationship Of Optimism Bias Regarding The Past With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

Table 20 presents correlations of the relative past experience indices with an average on-road risk-taking index and with self-reported crash involvement (from the Demographic and Control Variables Questionnaire). Correlations between relative past experience indices and corresponding personal experience indices were not considered because of the mathematical dependence of these scales.

Table 20: Correlations of relative past experience with the on-road risk-taking index and self-reported crash involvement (with n- and p-values), in Study 3.

	On-road risk-taking index	*Crash involvement*
Road-related negative index	.033	-.045
	(78)	(82)
	.774	.690
Road-related positive index	.038	-.083
	(76)	(82)
	.747	.456
Road-unrelated negative index	.048	-.111
	(79)	(83)
	.673	.317
Road-unrelated positive index	.006	-.083
	(78)	(82)
	.969	.456
Crash as driver at fault	.201	.035
	(80)	(84)
	.075	.752
Crash as driver not at fault	.021	.117
	(80)	(84)
	.851	.288
Crash as passenger	.131	.015
	(80)	(84)
	.248	.892

No significant correlation was observed between past-related optimism bias and on-road risk-taking, although correlations were all positive (but nonsignificant) and a low p-value was observed for "crash as a driver at fault". Past-related optimism bias also demonstrated no significant correlation with involvement in road (and other) trauma, and the direction of correlations was inconsistent.

Two further road-related relative past experience indices were computed by averaging scores for 3 events which involve crashing as a driver (4, 7, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &14).

Correlations were then computed between the corresponding road-related relative past experience and on-road risk-taking indices, and between the relative past experience of having 2 consecutive years of not being booked and the average index of behaviours which contribute to the likelihood of being booked. We also computed correlations of the relative past experience of being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The correlations of self-reported frequency of driving when tired with the relative past experience of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with the relative past experience of crash involvement as a passenger, were also computed. These "focussed" correlations are presented in Table 21.

No significant correlations were observed, and the direction of correlations was inconsistent.

Table 21: Correlations of specific road-related relative past experience indices and events, with self-reported frequency of performing corresponding on-road risk-taking behaviours (with n- and p-values), in Study 3.

	r	*n*	*p*
Crash involvement as a driver index	.114	78	.319
Impairment index	-.043	80	.707
Been booked	.152	81	.176
Booked for speeding	-.030	82	.791
Booked for doing an illegal U-turn	.117	83	.291
Booked for running a red light	.175	84	.112
Booked for driving with a BAC over the legal limit	-.067	84	.547
Driving safely while tired	.102	82	.359
Crash involvement as a passenger	-.051	84	.648

8.4.13 The Relationship Of Personal Future Risk Estimates With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

Table 22 presents correlations of the personal future risk indices with an average on-road risk-taking index, with corresponding personal experience indices, and with self-reported crash involvement (from the Demographic and Control Variables Questionnaire).

Thus, no significant correlations were observed between personal future risk estimates and on-road risk-taking. For positive indices, both correlations were negative but nonsignificant. Correlations were positive but nonsignificant for 3 of 5 negative indices.

No significant correlation was observed between personal past experience and future expectation, although all but one correlation was positive and a low p-value was observed for the negative road-unrelated index. Personal future risk estimates demonstrated no significant correlation with self-reported crash involvement, although all correlations were negative and the p-value for "crash as a driver not at fault" was low.

Personal future risk scores were significantly positively correlated with personal experience scores for 3 negative events (lowest significant r=.221, n=82, p=.046) and 13 further correlations were in a direction suggesting that past experience influences personal future risk estimates.

Two further road-related personal risk indices were computed by averaging scores for 4 events which involve crashing as a driver (4, 7, 8, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &16).

Correlations were then computed between the corresponding personal future risk and on-road risk-taking indices, and between the personal future likelihood of having 2 consecutive years of not being booked and the average index of behaviours which contribute to the likelihood of being booked. We also computed correlations of the personal future risk scores for being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The correlations of self-reported frequency of driving when tired with the personal future likelihood of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with the personal future risk of crash involvement as a passenger, were also computed. These "focussed" correlations are presented in Table 23.

Four significant correlations were observed in a direction suggesting that frequency of performing risk-relevant behaviours influences with personal future risk estimates.

Table 22: Correlations of personal future risk with the on-road risk-taking index, corresponding personal past experience indices, and self-reported crash involvement (with n- and p-values), in Study 3.

	On-road risk-taking index	*Corresponding personal experience index*	*Crash involvement*
Road-related negative index	.106 (80) .348	.118 (83) .288	-.147 (85) .179
Road-related positive index	-.130 (81) .247	.104 (81) .358	-.028 (86) .799
Road-unrelated negative index	-.066 (82) .557	.209 (85) .055	-.134 (87) .218
Road-unrelated positive index	-.002 (82) .985	.164 (86) .131	-.061 (87) .576
Crash as driver at fault	.076 (82) .498	-.040 (87) .710	-.091 (87) .402
Crash as driver not at fault	.058 (82) .603	.093 (86) .395	-.207 (87) .055
Crash as passenger	-.197 (81) .078	.091 (85) .407	-.064 (86) .560

Table 23: Correlations of specific personal future risk indices and events, with self-reported frequency of performing corresponding on-road risk-taking behaviours (with n- and p-values), in Study 3.

	r	*n*	*p*
Crash involvement as a driver index	.148	82	.183
Impairment index	-.031	86	.774
3 consecutive years without being booked	-.236	85	.030*
Booked for speeding	.264	86	.014*
Booked for doing an illegal U-turn	.229	85	.035*
Booked for running a red light	.425	87	<.001**
Booked for driving with a BAC over the legal limit	.096	87	.376
Driving safely while tired	.205	87	.057
Crash involvement as a passenger	.064	86	.559

8.4.14 Comparison Of The Relationship Of Optimism Bias Regarding The Future Versus The Past With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

The correlations of the relative future risk indices with self-reported on-road risk-taking and crash involvement (from the Demographic and Control Variables Questionnaire), were compared to the correlations of the relative past experience indices with self-reported on-road risk-taking and self-reported crash involvement. No significant differences were observed (highest nonsignificant z=1.351).

8.4.15 Comparison Of The Relationship Of Optimism Bias Regarding The Future Versus Personal Future Risk Estimates With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

The correlations of the relative future risk indices with self-reported on-road risk-taking and crash involvement (from the Demographic and Control Variables Questionnaire), were compared to the correlations of the personal future risk indices with self-reported on-road risk-taking and self-reported crash involvement. No significant differences were observed (highest z=1.009).

8.4.16 The Relationship Of Self-Reported Risk-Taking On The Road With Self-Reported Involvement In Road (And Other) Trauma

Table 24 presents correlations of the on-road risk-taking index with personal experience indices, and with self-reported crash involvement (from the Demographic and Control Variables Questionnaire).

No significant correlation was observed between self-reported on-road risk-taking and personal experience or self-reported crash involvement, and most correlations were in the direction inconsistent with the prediction that greater on-road risk-taking would contribute to more negative experiences, and fewer positive experiences.

Table 24: Correlations of the on-road risk-taking index with personal past experience indices, and with self-reported crash involvement (with n- and p-values), in Study 3.

	r	*n*	*p*
Road-related negative index	.166	80	.070
Road-related positive index	.073	77	ns
Road-unrelated negative index	-.076	80	ns
Road-unrelated positive index	.005	81	ns
Crash as driver at fault	-.267	82	ns
Crash as driver not at fault	-.037	81	ns
Crash as passenger	-.051	81	ns
Self-reported crash involvement	-.131	82	ns

ns= correlation in the direction opposite to prediction, and thus not significant according to the 1-tailed test employed.

Two further road-related personal experience indices were computed by averaging scores for 3 events which involve crashing as a driver (4, 7, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &14).

Correlations were then computed between corresponding on-road risk-taking and road-related personal experience indices, and between the average index of behaviours which contribute to the likelihood of being booked and the relative past experience of having 2 consecutive years of not being booked. We also computed correlations of personal experience of being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The correlations of self-reported frequency of driving when tired with personal experience of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with personal experience of crash involvement as a passenger, were also computed. These "focussed" correlations are presented in Table 25. Positive correlations were expected.

Table 25: Correlations of self-reported frequency of performing corresponding on-road risk-taking behaviours with specific personal experience indices and events, and with self-reported crash involvement (with n- and p-values), in Study 3.

	r	*n*	*p*
Crash involvement as a driver index	.112	81	.161
Impairment index	-.023	82	ns
Been booked	.154	85	.080
Booked for speeding	.264	86	.007*
Booked for doing an illegal U-turn	.229	85	.018*
Booked for running a red light	.425	87	<.001**
Booked for driving with a BAC over the legal limit	.096	87	.188
Driving safely while tired	.205	87	.029*
Crash involvement as a passenger	.064	86	.280

ns= correlation in the direction opposite to prediction, and thus not significant according to the 1-tailed test employed.

Four significant correlations were observed in a direction suggesting that the frequency of performing risk-relevant behaviours is associated with high personal experience of negative events. Four further correlations were in this direction (but were not significant).

8.4.17 Relationship Of Demographic Variables, Driving Experience, And Social Desirability With Optimism Bias Regarding The Past And Future, On-Road Risk-Taking And Involvement In Road (And Other) Trauma.

We computed correlations of age, average number of hours spent driving each week (as a driver and as a passenger), number of years licensed, and social desirability with the relative future risk indices, the relative past experience indices, the average on-road risk-taking index, personal past experience indices and self-reported crash involvement (from the Demographic and Control Variables Questionnaire). The relationship of optimism bias, on-road risk-taking and road-trauma involvement with gender was assessed employing independent samples t-tests with gender as the grouping variable. All hypotheses were tested 2-tailed.

Optimism bias demonstrated no significant correlation with age (highest nonsignificant r=-.201, n=82, p=.069), driving experience (highest nonsignificant r=.213, n=85, p=.050). Optimism bias was not significantly associated with social desirability (highest nonsignificant r=-189, n=86, p=.081). Females were more optimistically biased than males in relation to the relative past-

experience negative road-unrelated index and injury as a driver not at fault (t_{80}=2.76, p=.007, t_{81}=2.66, p=.010, respectively).

The on-road risk-taking index was not significantly associated with age (r=-.181, n=81, p=.106), number of hours spent driving as a driver (r=-.101, n=82, p=.368) or as a passenger (r=-.023, n=82, p=.837), years licensed (r=-.125, n=82, p=.263), or social desirability (impression management: r=-.187, n=82, p=.093; self-defense: r=-.066, n=82, p=.554). Females reported taking significantly fewer risks overall than males (t_{79}=2.28, p=.005).

Personal past experience indices and self-reported crash involvement were regarded as indicators of involvement in road (and other) trauma. These indices correlated significantly with age for the relative past experience road-related negative index (r=-.298, n=84, p=.006) and "been injured in a crash as a passenger (r=-.255, n=85, p=.019). Personal experience of injury in a crash as a passenger also correlated significantly with number of hours spent per week as a passenger, and number of years licensed (r=.260, n=86, p=.015, r=-.213, n=86, p=.049). No significant associations were observed with number of hours spent per week as a driver (highest nonsignificant r=.188, n=87, p=.082), or social desirability (highest nonsignificant r=-.200, n=85, p=.066). Females reported significantly more experience of injury as a driver at fault than did males (t_{84}=2.61, p=.011).

8.5 DISCUSSION

The results of Study 3 demonstrate the potential of both the CDTA and USYD interventions for reducing future- and past-related optimism bias.

The CDTA intervention was found to be somewhat effective in reducing optimism bias. People who were exposed to this intervention demonstrated significantly lower relative risk estimates than people who had not yet participated in the course in relation to being killed in a crash as a driver at fault or as a passenger, as well as having 2 consecutive years without being booked and having gastrointestinal illness. Means were in the predicted direction for all indices except the road-unrelated positive index, but none of these differences were significant. Further, control participants demonstrated future-related optimism bias regarding being killed in a crash as a driver at fault, having 2 consecutive years without being booked, and having gastrointestinal illness, whereas CDTA participants did not. However, optimism bias regarding the event "avoid a crash nearly caused by another driver" was observed amongst CDTA participants only. CDTA participants did not differ significantly from control participants for any relative experience indices or events, although means were in the predicted direction for all but one index. There was further evidence of the CDTA intervention reducing optimism bias relative to controls for subjects who rated future risk before relative experience (but not vice versa), and for subjects who rated the average peer before themselves (but not vice versa).

The USYD intervention appeared to be roughly equivalent to the CDTA intervention, or was perhaps slightly more effective in reducing future-related optimism bias. Relative future risk scores were significantly lower amongst USYD participants than amongst CDTA participants for the road-related positive index and the event "avoid a crash nearly caused by another driver", but were significantly higher amongst USYD participants in relation to being killed in a crash as a driver at fault. Means for remaining indices and events were in no consistent direction. Optimism bias was observed in relation to avoiding a crash nearly caused by another driver amongst CDTA but not USYD participants, and means were more frequently in a direction inconsistent with optimism bias in the USYD than in the CDTA condition. Relative experience scores were significantly lower in the USYD condition for the road-unrelated positive index and the event "traveled overseas", but were significantly higher amongst USYD participants for "had your wallet stolen". Remaining means were

generally (nonsignificantly) lower for CDTA participants. Past-related optimism bias regarding "had your wallet stolen" was observed amongst USYD participants only, however optimism bias regarding "had the car you were driving stolen" was observed amongst CDTA but not USYD participants.

The efficacy of the CDTA intervention (and thus presumably the USYD intervention) appeared to be durable. Individuals who had participated in the CDTA course 2 years earlier did not differ significantly from initial CDTA course participants, for those events which demonstrated a significant difference between (initial) CDTA participants and control participants.

Both interventions focussed on road-related events to a greater extent than road-unrelated events, and indeed most significant group differences were observed for road-related events. Nonetheless, there is some evidence for a generalisation of impact of the intervention to optimism bias regarding road-unrelated events. For example, CDTA participants had lower relative experience scores than control participants for "have gastrointestinal illness" (as well as 3 road-related events). Thus, the intervention may have health benefits beyond reducing road trauma.

Study 3 replicated the results of Study 1 in demonstrating road-related optimism bias regarding the future and the past, as well as a complex relationship between risk-perception and on-road risk-taking.

On average, subjects in the present sample believed that they are less likely than their peers to experience negative road-related events, as well as road-unrelated events. The observation of optimism bias regarding positive road-related and road-unrelated events suggests that these results are unlikely to be the result of a response bias.

Past-related optimism bias was also observed in the present sample. That is, on average subjects believed that they have had less past experience of negative events, and more past experience of positive events. Past-related optimism bias was observed for most indices and several events.

Again, there was some evidence to support the view that road-related optimism bias is greater than road-unrelated optimism bias. A significant difference was observed for the negative relative experience index.

In the present study, there was some evidence for past-related optimism bias being greater than future-related optimism bias (as demonstrated in earlier studies). For the indices relating to injury/death in a crash as a passenger the difference was significant, and 4 further indices conformed to this pattern (although nonsignificantly)

Evidence for a positive association between past- and future-related optimism bias was weaker than in earlier studies. Significant correlations were observed for only 1 index and 3 events (correlations were positive but nonsignificant for a further 5 indices and 9 events).

Observed relationships between relative future risk and on-road risk-taking generally suggest that less risk-taking is associated with greater optimism bias. Correlations for the main indices were mostly negative, and 2 were significant. No significant negative relationship was observed for the "focussed" indices (although 8 of 9 correlations were negative but nonsignificant). These results are consistent with the view than risk-taking influences optimism bias rather than vice versa.

For relative experience, no significant correlations with on-road risk-taking were observed, and the directions of correlations were inconsistent, in contrast to Study 1 results.

Personal future risk estimates also demonstrated significant relationships with on-road risk-taking. For the main indices no significant relationship was observed, and the valence of correlations was inconsistent. For the "focussed" indices, 3 significant positive correlations were observed for negative indices, whereas a significant negative correlation was observed for 1 positive index. Again, these results are consistent with the view that risk-taking influences risk perception rather than vice versa.

As in Study 1, relationships of on-road risk-taking with relative future risk did not differ significantly from the relationships observed between on-road risk-taking and relative experience, or personal risk.

Relative future risk demonstrated no significant correlations with personal experience or self-reported crash involvement. Observed correlations were mostly negative for negative events and positive for positive events. Thus, these findings offer no support for the view that low past experience of negative events and high past experience of positive events contributes to optimism bias.

In contrast to Study 1 findings, no significant correlation was observed between relative experience and self-reported crash involvement. Further, correlations were in no consistent direction.

Personal future risk estimates also demonstrated no relationship with past experience to suggest that good experiences in the past produce and expectation of good experiences in the future. Personal future risk indices generally demonstrated positive (but nonsignificant) associations with past experience, and negative (but nonsignificant) associations with self-reported crash involvement.

As in Study 1 and 2, the evidence is mostly consistent with the view that risk-taking and trauma involvement influences risk perception, rather than vice versa. Nonetheless, the effect of manipulating optimism bias on risk-taking remains worthwhile. The instructions developed for the present study appear to have some efficacy in reducing optimism bias, and so might be a useful tool in this enterprise.

Study 3 provided only limited support for the hypothesis that on-road risk-taking correlates significantly and positively with involvement in road (and other) trauma.

In summary, the present study presents interventions which may reduce road-related optimism bias for up to 2 years. Success in reducing optimism bias is noteworthy, given the recognised difficulty of this enterprise (see Weinstein & Klein, 1995), and the possibly large practical impact of even a small change in optimism bias on risk taking.

9 SUMMARY

Taken together these studies demonstrate that optimism bias regarding road related events exists and that it can be lastingly reduced with relatively easy-to-administer interventions, which are based on theories of optimism bias. These reductions may have substantial practical benefits in terms of reducing risk-taking and trauma involvement, both on and off the road.

Optimism bias regarding road-related as well as road-unrelated events has been demonstrated consistently in the present research program. Generally, participants believed themselves to be less likely to experience negative events, and more likely to experience positive events, in the future, compared to their peers. Optimism bias was observed amongst for university students (Studies 1 & 2) and participants of corporate driver training courses (Study 3).

Past-related optimism bias was also observed for road-related, as well as road-unrelated, events in both student and driver training samples. That is, participants believed that they have less past experience of negative events, and more past experience of positive events, compared to their peers. Each study offered some evidence that optimism bias regarding the past is greater than optimism bias regarding the future, and this evidence was most convincing in Study 2.

Past-related optimism bias was positively related to optimism bias in all 3 studies, which is consistent with the claim that past-related optimism bias contributes to future-related optimism bias. Of course, these data may also reflect the opposite causal relationship, or that the two forms of optimism bias share common mechanisms. However, the finding in Study 2 that instructions designed

to reduce past-related optimism bias reduced both past- and future-related optimism bias, whereas instructions designed to reduce future-related optimism bias only reduced future-related optimism bias lend credence to the first interpretation. Thus, instructions designed to reduce past-related optimism bias may be an important addition to instructions designed to reduce future-related optimism bias.

Both in relation to the future and the past, optimism bias regarding road-related events was greater than optimism bias regarding road-unrelated events (Studies 1-3), suggesting that it may have substantial impact on risk-taking on the road and involvement in road trauma.

The relationship of risk-perception (relative future risk, relative past experience, and personal future risk) with on-road risk-taking was found to be complex. In all three studies, there was more evidence for the claim that risk-taking influences risk-perception rather than vice versa. That is, relative future risk estimates and relative past experience ratings generally correlated negatively with on-road risk-taking, so that risk-taking appears to undermine optimism bias (rather than being promoted by it). On-road risk-taking correlated positively with estimates of personal risk for negative events, and negatively with estimates of personal likelihood for positive events, suggesting that more risk-taking translates into greater perceived risk (rather than being inhibited by it).

Nonetheless, each study provided some evidence for the claim that optimism bias and low perceived personal risk promotes on-road risk-taking. For example, in Study 1, relative future risk of avoiding a crash nearly caused by another driver, and of driving safely while tired, correlated positively and significantly with the on-road risk-taking index. Similarly, relative past experience of driving safely while tired also correlated significantly and positively with the frequency of continuing to drive when tired. Perceiving a high likelihood of having 3 consecutive years without being booked was associated with frequent performance of illegal driving behaviours (e.g. running a red light, driving with a BAC above the legal limit). Similarly, perceiving a high likelihood of driving safely while tired was associated with frequently continuing to drive when tired. Perceiving a high likelihood of avoiding a crash nearly caused by another driver was associated with a high score on the on-road risk-taking index.

The relationship of risk-perception (relative future risk, relative past experience, and personal future risk) with involvement in road (and other) trauma was consistent with the above results and the consistent positive relationship between on-road risk-taking and involvement in road (and other) trauma (detected in all 3 studies). Generally, relative future risk estimates and relative past experience ratings generally correlated negatively with involvement in road (and other) trauma, such that less trauma involvement appears to contribute to optimism bias. Involvement in road trauma correlated positively with estimates of personal risk for negative events, and negatively with estimates of personal likelihood for positive events. (Personal experience with positive events generally correlated positively with perceived personal future chances of experiencing positive events.)

Nonetheless, some observed relationships were consistent with the view that risk perception influences involvement in road trauma rather than vice versa. For example, in Study 1, high optimism bias regarding the chances of being injured in a crash as a passenger was associated with greater experience of this event. Similarly, high perceived personal risk of having a crash as a driver not at fault was associated with low personal experience of this event.

In each Study, the relationship of on-road risk-talking and involvement in road (and other) trauma with future-related optimism bias was roughly equivalent to their relationship with past-related optimism bias and personal risk estimates.

These results suggest that road-related optimism bias may contribute to risk-taking on the roads and involvement in road trauma. Thus, interventions which reduce road-related optimism bias may be a valuable contribution to road safety. Further, since driver training programs may promote optimism bias, such interventions may be a critical component of these programs.

In Study 2 we developed instructions designed to reduce future-related optimism bias and designed to reduce past-related optimism bias, and demonstrated the effectiveness of these interventions in reducing optimism bias relative to control instructions. These instructions alerted subjects to optimism bias and its possibly harmful impact on on-road risk-taking and involvement in road trauma. Subjects were also offered techniques for avoiding optimism bias which were based on theories of optimism bias. For example, they were told to remember that other drivers take precautions.

The instructions designed to reduce future-related optimism bias met with some success. Subjects given these instructions demonstrated significantly lower relative future risk estimates than subjects given control instructions for several road-related events and one road-unrelated event. Means were in the predicted direction for many of the remaining events. Further, subjects exposed to future-related instructions did not demonstrate optimism bias regarding "having the car you are driving stolen", "having 3 consecutive years without being booked", and "owning your own home", whereas subjects exposed to control instructions did.

Instructions designed to reduce past-related optimism bias were also effective. Relative past experience scores were significantly lower amongst subjects given the past-related instructions than amongst subjects given control instructions, for the road-unrelated negative index, injury as a driver at fault, and several further events. Means were in the predicted direction for many of the remaining events. Further, subjects exposed to past-related instructions did not demonstrate optimism bias regarding the road-unrelated negative index, "had pneumonia", and "had your wallet stolen", whereas subjects exposed to control instructions did.

The impact of past-related instructions on future-related optimism bias suggests the impact of the instructions designed to reduce future-related optimism bias may be enhanced by adding information designed to reduce past-related optimism bias. We adopted this approach in Study 3.

In Study 3, we evaluated a session of the Corporate Driver Training Australia (CDTA) program which is designed to reduce optimism bias. We also compared the efficacy of this session to an intervention based on the instructions employed to reduce future-related optimism bias in Study 2. We modified these instructions by incorporating instructions designed to reduce past-related optimism bias, and by offering more detailed and explicit techniques for avoiding optimism bias.

Both interventions were somewhat successful in reducing optimism bias. Participants who were exposed to the CDTA intervention demonstrated significantly lower relative risk estimates than control participants in relation to being killed in a crash as a driver at fault or as a passenger, as well as having 2 consecutive years without being booked and having gastrointestinal illness. Means were in the predicted direction for all road-related indices and the road-unrelated negative index. Further, control participants demonstrated future-related optimism bias regarding being killed in a crash as a driver at fault, having 2 consecutive years without being booked, and having gastrointestinal illness, whereas CDTA participants did not. CDTA participants did not differ significantly from control participants for any relative experience indices or events, although means were in the predicted direction for all but one index. There was further evidence of the CDTA intervention reducing future- and past-related optimism bias relative to controls for subjects who rated future risk before relative experience (but not vice versa), and for subjects who rated the average peer before themselves (but not vice versa).

The USYD intervention was about as effective as the CDTA intervention. Relative future risk scores were significantly lower amongst USYD participants than amongst CDTA participants for the road-related positive index and the event "avoid a crash nearly caused by another driver", but were significantly higher amongst USYD participants in relation to being killed in a crash as a driver at fault. Optimism bias was observed in relation to avoiding a crash nearly caused by another driver amongst CDTA but not USYD participants, and means were more frequently in a direction inconsistent with optimism bias in the USYD than in the CDTA condition. Relative experience

scores were significantly lower in the USYD condition for the road-unrelated positive index and the event "traveled overseas", but were significantly higher amongst USYD participants for "had your wallet stolen". Past-related optimism bias regarding "had your wallet stolen" was observed amongst USYD participants only, however optimism bias regarding "had the car you were driving stolen" was observed amongst CDTA but not USYD participants.

Study 3 also demonstrated that the reductions in optimism bias produced by the CDTA intervention persist for up to 2 years. Individuals who had participated in the CDTA course 2 years earlier did not differ significantly from initial CDTA course participants, for those events which demonstrated a significant difference between (initial) CDTA participants and control participants. It remains to be tested whether the USYD intervention is effective in reducing optimism bias in the long-term.

The interventions employed in Studies 2 and 3 focussed mainly on road-related events, and their main impact was on road-related optimism bias. Nonetheless, road-unrelated optimism bias was also reduced by these interventions. For example, in Study 2, subjects exposed to instructions designed to reduce future-related optimism bias demonstrated lower relative risk estimates than control subjects in relation to ""have the car you are driving stolen", and "own your own home". In Study 3, CDTA participants had lower relative experience scores than control participants for "have gastrointestinal illness". Thus, these interventions may produce health benefits besides improving road-safety.

The importance of these findings should not be underestimated. Success in reducing optimism bias is rare (see Weinstein & Klein, 1995), and may have substantial theoretical and practical impact. Fir example, only by manipulating optimism bias can its impact on risk-taking be properly assessed. Further, if optimism bias promotes risk-taking in the manner often proposed, even small reductions in optimism bias may have substantial health benefits.

The present results speak for a role of experience in contributing to optimism bias. Apart from the efficacy of the past-related instructions described above, exposure variables were fairly consistently related to optimism bias. In Study 1, optimism bias was positively associated with age. In Studies 1 and 3, optimism bias was also associated with the number of hours participants reported driving per week (as a driver and as a passenger), and the number of years participants reported having held their license. In Study 2, optimism bias correlated only with the number of hours participants reported driving per week (as a driver). Since most participants have had very little involvement in road trauma (e.g. in all studies subjects had 1 crash on average), these findings are consistent with the contention that extensive safe driving experience contributes to optimism bias.

Exposure variables were also positively associated with involvement in road and other trauma. In all three studies, involvement in road trauma was significantly positively associated with the number of hours participants reported driving per week as a driver, and the number of years participants reported having held their license. In Studies 1 and 3, involvement in road (and other) trauma also demonstrated significant positive relationships with the number of hours participants reported driving per week as a passenger were also observed. In Study 2, self-reported crash involvement correlated significantly and positively with age. Thus, unsurprisingly, greater driving exposure is associated with greater trauma involvement.

Self-reported on-road risk-taking was significantly negatively correlated with social desirability in all three studies. Thus, self-reports of on-road risk-taking may have been distorted by social desirability, and indeed subjects generally reported being fairly safe drivers in terms of the risks they take. Alternatively, people who have a tendency to conform to social norms may be less likely to take risks.

Several relationships with demographic variables are noteworthy. In Study 2, older drivers reported taking more risks. However, this result should be interpreted with an awareness of the

restricted age range of Study 2 participants. In Study 3, females reported significantly greater injury as a driver than males.

10 RECOMMENDATIONS

TITLE	NO.	RECOMMENDATION
Existence of optimism bias, and relationship with risk taking Pg 3, 14, 27, 36, 51, 19, 21, 59, 60, 111, 113	1	Road-related optimism bias exists and may contribute to risk-taking on the roads and thus to involvement in road trauma. Thus, interventions which reduce optimism bias should be harnessed as a means of promoting road safety.
Driver training programs may promote optimism bias Pg 6	2	Driver training programs may promote optimism bias (and this may partly account for their limited efficacy as road safety countermeasures). Thus, it is particularly critical that interventions which reduce optimism bias be incorporated in driver training programs. This need should be promoted.
Effectiveness of present interventions Pg 34, 37, 42, 49, 66	3	The interventions employed in the present research program have proven to be effective in reducing road-related (as well as road-unrelated) optimism bias. This is notable in view of the difficulty of reducing optimism bias. The interventions described in the present report should thus form the basis of interventions employed in future to combat road-related optimism bias.
Features which contribute to effectiveness Pg 7, 31, 45	4	Several features of the present interventions are likely to play an important role in their effectiveness, and should be included in future interventions.
Past-related optimism bias exists and may contribute to future related optimism bias Pg 14, 17, 39, 53, 54, 107	5	Past-related optimism bias regarding road-related events exists and may contribute to future-related optimism bias. Past- and future-related optimism bias are positively associated, and instructions designed to reduce past-related optimism bias reduce future-related optimism bias (as well as past-related optimism bias), whereas the reverse is not the case. Safe driving experience is also positively associated with optimism bias. Thus, techniques which reduce past-related optimism bias (e.g. by identifying it) are likely to be important in reducing future-related optimism bias.
Need to base techniques on theories of optimism bias Pg 7, 31	6	Further techniques for reducing future-related optimism bias should be based on well-supported theories of optimism bias, and must be offered in clear and explicit terms.

TITLE	NO.	RECOMMENDATION

Importance of promoting motivation to reduce optimism bias Pg 43	7	The intervention must incorporate messages designed to motivate the target audience to reduce their optimism bias. People tend to defend their optimism bias and must be given a reason to change it. In the present program we sought to motivate participants with the message that optimism bias could be harmful to their health because it may promote on-road risk-taking.
Need for further evaluation and refinement	8	The present interventions are already suitable for practical application, however their efficacy may be further increased with additional evaluation and refinement. For example, it would be worthwhile to assess the long term impact of reduction of optimism bias on on-road risk-taking and road trauma involvement. Further, the durability of the changes wrought by the USYD intervention remains to be assessed. Finally, closer analysis of the aspects of the interventions which are effective, and of the potential to improve the interventions, is warranted.

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APPENDIX 1: QUESTIONNAIRES EMPLOYED IN STUDIES 1 & 2

In this questionnaire you are asked about your beliefs regarding your future, and about your beliefs regarding the future for an average person of your age and gender. You are also asked about some personal details.

Some of this questionnaire is the same as the one you completed earlier. We are not testing if you remember your earlier answers, so don't feel you have to give the same responses. Please try to answer these questions as though it is the first time you are seeing them.

Again, all your answers are anonymous, so please do not write your name on the questionnaire. Also, there are no right or wrong answers- we are interested in what you think, even if you are not sure it is correct.

Thank you for your participation and co-operation.

1. *Please estimate the likelihood that the following events will happen to you in the future, by circling a number from 1 to 7, where the numbers mean:*

1= Extremely unlikely to happen to you
2= Very unlikely to happen to you
3= Unlikely to happen to you
4= Neither likely nor unlikely to happen to you
5= Likely to happen to you
6= Very likely to happen to you
7= Extremely likely to happen to you

1. Be booked for speeding	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. Not be hospitalised in the next 5 years for illness or injury	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. Travel overseas in the next 5 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. Have a crash, as a driver at fault	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. Have pneumonia	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6. Be able to stop quickly in an emergency while driving	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7. Be injured in a crash, as a driver at fault	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8. Be killed in a crash, as a driver at fault	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9. Have 3 consecutive years of crash-free driving	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10. Have 3 consecutive years without being booked	**1**	**2**	**3**	**4**	**5**	**6**	**7**
11. Be booked for doing an illegal U-turn	**1**	**2**	**3**	**4**	**5**	**6**	**7**
12. Get very good marks at university	**1**	**2**	**3**	**4**	**5**	**6**	**7**
13. Be injured in a crash, as a driver not at fault	**1**	**2**	**3**	**4**	**5**	**6**	**7**
14. Be killed in a crash, as a driver not at fault	**1**	**2**	**3**	**4**	**5**	**6**	**7**
15. Have the car you are driving stolen	**1**	**2**	**3**	**4**	**5**	**6**	**7**
16. Avoid a crash nearly caused by another driver	**1**	**2**	**3**	**4**	**5**	**6**	**7**
17. Drive safely if driving while tired	**1**	**2**	**3**	**4**	**5**	**6**	**7**
18. Be booked for running a red light	**1**	**2**	**3**	**4**	**5**	**6**	**7**
19. Have gastrointestinal illness	**1**	**2**	**3**	**4**	**5**	**6**	**7**
20. Have your wallet stolen	**1**	**2**	**3**	**4**	**5**	**6**	**7**
21. Be injured in a crash, as a passenger	**1**	**2**	**3**	**4**	**5**	**6**	**7**
22. Be killed in a crash, as a passenger	**1**	**2**	**3**	**4**	**5**	**6**	**7**
23. Own your own home	**1**	**2**	**3**	**4**	**5**	**6**	**7**
24. Be booked for driving with a blood alcohol content over the legal limit	**1**	**2**	**3**	**4**	**5**	**6**	**7**

1. *Please estimate the likelihood that the following events will happen to the average person of your age and gender, by circling a number from 1 to 7, where the numbers mean:*

1= Extremely unlikely to happen to the average person
2= Very unlikely to happen to the average person
3= Unlikely to happen to the average person
4= Neither likely nor unlikely to happen to the average person
5= Likely to happen to the average person
6= Very likely to happen to the average person
7= Extremely likely to happen to the average person

1. Be booked for speeding	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. Not be hospitalised in the next 5 years for illness or injury	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. Travel overseas in the next 5 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. Have a crash, as a driver at fault	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. Have pneumonia	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6. Be able to stop quickly in an emergency while driving	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7. Be injured in a crash, as a driver at fault	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8. Be killed in a crash, as a driver at fault	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9. Have 3 consecutive years of crash-free driving	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10. Have 3 consecutive years without being booked	**1**	**2**	**3**	**4**	**5**	**6**	**7**
11. Be booked for doing an illegal U-turn	**1**	**2**	**3**	**4**	**5**	**6**	**7**
12. Get very good marks at university	**1**	**2**	**3**	**4**	**5**	**6**	**7**
13. Be injured in a crash, as a driver not at fault	**1**	**2**	**3**	**4**	**5**	**6**	**7**
14. Be killed in a crash, as a driver not at fault	**1**	**2**	**3**	**4**	**5**	**6**	**7**
15. Have the car they are driving stolen	**1**	**2**	**3**	**4**	**5**	**6**	**7**
16. Avoid a crash nearly caused by another driver	**1**	**2**	**3**	**4**	**5**	**6**	**7**
17. Drive safely if driving while tired	**1**	**2**	**3**	**4**	**5**	**6**	**7**
18. Be booked for running a red light	**1**	**2**	**3**	**4**	**5**	**6**	**7**
19. Have gastrointestinal illness	**1**	**2**	**3**	**4**	**5**	**6**	**7**
20. Have their wallet stolen	**1**	**2**	**3**	**4**	**5**	**6**	**7**
21. Be injured in a crash, as a passenger	**1**	**2**	**3**	**4**	**5**	**6**	**7**
22. Be killed in a crash, as a passenger	**1**	**2**	**3**	**4**	**5**	**6**	**7**
23. Own their own home	**1**	**2**	**3**	**4**	**5**	**6**	**7**
24. Be booked for driving with a blood alcohol content over the legal limit	**1**	**2**	**3**	**4**	**5**	**6**	**7**

3. *Please estimate how often the following events* ***have happened to*** *you in the past, by writing a number in the space provided. When you are asked how often a driving-related event has happened in the past year, if you have been driving for less than one year please indicate how often the event has happened in the time you have been driving.*

1. Booked for speeding	
2. Been hospitalised for illness or injury	
3. Traveled overseas	
4. Had a crash, as a driver at fault	
5. Had pneumonia	
6. Been able to stop quickly in an emergency	
7. Injured in a crash, as a driver at fault	
8. Had a crash	
9. Been booked	
10. Booked for doing an illegal U-turn	
11. Got very good overall marks in end-of year exams at school *(answer between 1 and 6)*	
12. Injured in a crash, as a driver not at fault	
13. Had car you have been driving stolen	
14. Avoided a crash nearly caused by another driver	
15. Drove safely while tired	
16. Booked for running a red light	
17. Had gastrointestinal illness	
18. Had your wallet stolen	
19. Injured in a crash, as a passenger	
20. Booked for driving with a blood alcohol content over the legal limit	

4. *Please estimate how often the following events* ***have happened to*** *the average person of your age and gender in the past, by writing a number in the space provided. When you are asked how often a driving-related event has happened in the past year, if you think the average person has been driving for less than one year please indicate how often the event has happened in the time you think they have been driving.*

1. Booked for speeding	
2. Been hospitalised for illness or injury	
3. Traveled overseas	
4. Had a crash, as a driver at fault	
5. Had pneumonia	
6. Been able to stop quickly in an emergency	
7. Injured in a crash, as a driver at fault	
8. Had a crash	
9. Been booked	
10. Booked for doing an illegal U-turn	
11. Got very good overall marks in end-of year exams at school *(answer between 1 and 6)*	
12. Injured in a crash, as a driver not at fault	
13. Had car they have been driving stolen	
14. Avoided a crash nearly caused by another driver	
15. Drove safely while tired	
16. Booked for running a red light	
17. Had gastrointestinal illness	
18. Had your wallet stolen	
19. Injured in a crash, as a passenger	
20. Booked for driving with a blood alcohol content over the legal limit	

The next set of questions ask you how often you do certain actions while driving. When choosing your answer, think about your driving over the past year, and circle the number that best represents how often you do the following:

0= Never
1= Hardly ever
2= Occasionally
3= Quite often
4= Frequently
5= Nearly all the time
6= Always

1. Run a red light	**0**	**1**	**2**	**3**	**4**	**5**
2. Keep driving even though you are very tired	**0**	**1**	**2**	**3**	**4**	**5**
3. Do an illegal U-turn	**0**	**1**	**2**	**3**	**4**	**5**
4. Stop driving if you want to talk on a hand-held mobile phone	**0**	**1**	**2**	**3**	**4**	**5**
5. Change lanes without checking properly for vehicles in other lanes	**0**	**1**	**2**	**3**	**4**	**5**
6. Drive with a blood alcohol content above the legal limit	**0**	**1**	**2**	**3**	**4**	**5**
7. Drive while under the influence of illegal drugs that may impair your driving	**0**	**1**	**2**	**3**	**4**	**5**
8. Drive while under the influence of legal drugs (besides alcohol) that may impair your driving	**0**	**1**	**2**	**3**	**4**	**5**
9. Travel as a passenger of a driver with a blood alcohol content above the legal limit	**0**	**1**	**2**	**3**	**4**	**5**
10. Wear a seatbelt	**0**	**1**	**2**	**3**	**4**	**5**
11. Reduce your usual speed when it is raining	**0**	**1**	**2**	**3**	**4**	**5**
12. Turn right across a busy road even when there is a small chance of a collision	**0**	**1**	**2**	**3**	**4**	**5**
13. Exceed the speed limit by no more than 15km/hr	**0**	**1**	**2**	**3**	**4**	**5**

Please indicate which of the following statements apply to you by circling Yes (Y) or N (N).

1. It is sometimes hard for me to go on with my work if I am not encouraged	**Y**	**N**
2. I sometimes feel resentful when I don't get my way	**Y**	**N**
3. On a few occasions, I have given up doing something because I thought too little of my ability	**Y**	**N**
4. There have been times when I felt like rebelling against people in authority even though I knew they were right	**Y**	**N**
5. N matter who I'm talking to I am always a good listener	**Y**	**N**
6. There have been occasions when I took advantage of someone	**Y**	**N**
7. I'm always willing to admit it when I make a mistake	**Y**	**N**
8. I sometimes try to get even rather than forgive and forget	**Y**	**N**
9. I am always courteous, even to people who are disagreeable	**Y**	**N**
10. I have never been bothered when people have expressed ideas very different from mine	**Y**	**N**
11. There have been times when I was quite jealous of the good fortune of others	**Y**	**N**
12. I am sometimes irritated by people who ask favours of me	**Y**	**N**
13. I have never deliberately said something that hurt someone's feelings	**Y**	**N**

Please answer to the following questions about yourself.

1. How old were you at your last birthday?_____
2. Are you male or female?_____
3. What is the main language spoken at your home?_____
4. Which suburb your parents live in (if your parents are separated/divorced, answer for the parent with whom you spend the most time)? _____
5. How long have you had your license?_____years _____ months
6. How many hours do you spend driving (as a driver) in an average week?_____
7. How many hours do you spend driving (as a passenger) in an average week?_____
8. Do you own your own car or have permanent access to a car owned by someone else?_____
9. How many crashes have you been in as a driver?_____

If you have ever had a crash, think of the most severe, and answer the following questions by circling "Yes" or "No":

a) Was anyone killed? Yes No
b) Was anyone injured and hospitalised? Yes No
c) Was anyone injured and treated at the scene? Yes No
d) Was any vehicle towed away? Yes No
e) Were you at fault? Yes No
f) Was someone else at fault? Yes No
g) Were you booked? Yes No
h) Was another driver booked? Yes No
i) If you were booked, what was the charge?_____

12 APPENDIX 2: OVERHEADS EMPLOYED IN STUDY 3 (USYD INTERVENTION)

During the first part of the course we have talked about how you see your risks & about the importance of recognising actual risks. We have also talked about techniques you can use to help you to recognise risks.

Now we are going to talk about a phenomenon which might stop you from recognising actual risks, & offer you some techniques for avoiding it.

The phenomenon is called “unrealistic optimism.”

Unrealistic optimism

People often think that they are better off than their peers.
a) They estimate that the likelihood that they will experience negative events is LOWER than the likelihood that their average peer will experience negative events (e.g. injured in a car crash, early heart attack, be mugged).
b) They estimate that the likelihood that they will experience positive events is HIGHER than the likelihood that their average peer will experience positive events (e.g. healthy, happy life after 80 years of age).

In other words unrealistic optimism translates into the common belief: "It won't happen to me… I know it happens, but it won't happen to me".

People are unrealistically optimistic about driving. For example, many drivers think that they are less likely to crash, & that they are better & safer drivers, compared to their average peer. In addition, you may think that you are less likely than your peers to be hospitalised.

You probably experience unrealistic optimism

Thinking that you do not think this way is itself unrealistic optimism... everybody else probably thinks they don't think this way.

What was your rating for the question: "Over time I'm becoming a safer driver- compared to others, I'm pretty careful" (p.11)?

Think about the risks you take on the road. Don't you often take them because you don't really believe that you will crash?

The dangers of unrealistic optimism

Unrealistic optimism can be a problem. Believing that bad things are less likely than average to happen to you makes you behave dangerously.

For example, you may drive faster than you should because you think you won't crash (or be booked) anyway. Or you might not leave a large enough gap between you & the car in front of you in a line of moving traffic because you think you will be able to brake fast enough not to crash into the car in front.

One of the most important things you can do to reduce the chances of bad things, like crashing, from happening to you is to believe that they ARE JUST AS LIKELY TO HAPPEN TO YOU AS TO YOUR PEERS.

Fighting unrealistic optimism

It is very important that you learn not to be unrealistically optimistic. I will now outline some of the reasons you may have for thinking you are better off than your peers, & ask you to analyse them carefully.

1) You might think that "crashes happen fairly often" because you "read about them & see them on TV", & that you have had very little crash experience considering that you "have driven thousands of kilometers" since you got your license. So you may reason that you are a safer than average driver, & that you are less likely than your average peer to have a crash in the future.

BUT REMEMBER:

1. There are a lot of other drivers, & only one of you. Even though serious car crashes seem to happen a lot, the chance of any one "average driver" having a serious crash is relatively low.
2. Even if you have not yet had a crash, you could have one in future. There are many drivers who never have a serious crash.

2) Thinking that you have had a relatively incident (crash, injury, booking) free driving history (compared to your peers), may make you conclude that you are a safer driver, & that you are less likely to crash (or be injured or booked) in future.

BUT REMEMBER:

a) The belief that you have had a better driving past than your peers is probably unrealistic (as outlined on the last overhead)

1. Even if you have had better driving past than your peers, this does not mean you will have a better driving future than your peers.
2. All of the drivers on the road today have never been killed in a car crash… just like you. Some of today's drivers will be killed in a car crash in future. You could be one of them.

3) You may think that there is a particular kind of driver who drives dangerously or has crashes… & you are not this kind of driver. For example, you might think that "inexperienced drivers crash considerably more than experienced ones" & you have "driven thousands of kilometers" since you got your license.

BUT REMEMBER:

a) Experienced drivers have crashes too.

b) Some studies show that experienced drivers take more risks than inexperienced drivers, because they are *overconfident.*

c) Do not stereotype "unsafe drivers". Safe drivers sometimes drive unsafely... just like you. If you see a driver perform an unsafe act, don't immediately stereotype them as an unsafe driver.

d) You are not the only driver who takes precautions; other drivers take them too.

4) You may think that other drivers take many more risks, & make many more mistakes than you.

BUT REMEMBER:

a) You make mistakes too.
b) You probably notice other people's mistakes more often than you notice your own. For example, if the driver in front of you forgets to indicate before turning, you notice (& perhaps mutter something under your breath!), whereas if you forget to indicate you probably don't notice.
c) You might dismiss your mistakes because you understand the reasons for them (e.g. your blinker isn't working, you were tuning the radio, you were trying to see a street sign), whereas you don't understand the reasons behind other drivers' mistakes.
d) Other drivers may seem to make worse mistakes than you, because it is the big ones you notice.

5) You may simply want (or need) to think that you are unlikely to be injured in a crash, or to have a crash, or even to be booked.

BUT REMEMBER:

1. Driving is a potentially dangerous activity & crashes happen.
2. You can influence your chances of having a crash, being injured in a crash, or being booked.
3. One of the most important things you can do to reduce your chances of having a crash, being injured in a crash, or being booked is to judge risks accurately.
4. Do not deny your risk; face it & do something about it.

Not being unrealistically optimistic & being a Low Risk Driver is critical to your health & safety

What was your rating for the question "I would prefer not to be injured or killed in a car crash" (p. 11)?

You can influence your chances of being injured or killed in a car crash (or of having a crash or just being booked).

You need to be a Low Risk Driver.

In order maintain the motivation to be a Low Risk Driver you need to guard against being unrealistically optimistic.

Now you know what unrealistic optimism is, you know how to avoid it & you know how to be a Low Risk Driver. Please use your skills.

Were you *really* a safer than average driver this morning?
Will you be from now on?

Soon we will ask you to complete a questionnaire asking you about your beliefs regarding your future & your past. You will also be asked about your beliefs regarding the future & past for an average person of your age & gender. You will also be asked about some of your behaviours & personal details.

Please make sure your answers reflect what you REALLY think right now.

13 APPENDIX 3: QUESTIONNAIRES EMPLOYED IN STUDY 3

The University of Sydney

Dear Course Participant,

We would like you to help us to evaluate the driver training course you are participating in and to investigate attitudes to road safety. This may help design driver training courses which may be more helpful in reducing road trauma. Your decision to participate is valuable to us.

We are interested in your attitudes about driving, your beliefs about the future, as well as your driving behaviour and accident involvement.

So how can you help, please? We would appreciate it if you would take the time to complete the following questionnaires as accurately and honestly as possible. You should not record your name on the questionnaires as all your responses are anonymous. Please return the completed questionnaires in the reply-paid envelope provided. Please be assured that all information we collect will be strictly confidential, and only grouped data reported.

If you have a complaint about any aspect of this research, please contact the Human Ethics Officer at the University of Sydney (Gail Briody, ph: 9351 4811).

Your participation is very much appreciated.

Yours sincerely,

Dr Soames Job (Chief Investigator).

Julie Hatfield (Co-investigator, Ph: 9351 6807)

Today's date ____ / ____ / ____

In this questionnaire you are asked about your beliefs regarding your future and your past. You will also be asked about your beliefs regarding the future and past for an average person of your age and gender. You are also asked about some of your behaviours and personal details.

All your answers are anonymous, so please do not write your name on the questionnaire. Also, there are no right or wrong answers - we are interested in what you think, even if you are not sure it is correct.

Thank you for your participation and co-operation.

Please estimate the likelihood that the following events will happen to you in the future, by circling a number from 1 to 7, where the numbers mean:

1= Extremely unlikely to happen to you
2= Very unlikely to happen to you
3= Unlikely to happen to you
4= Neither likely nor unlikely to happen to you
5= Likely to happen to you
6= Very likely to happen to you
7= Extremely likely to happen to you

1. Be booked for speeding in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. Not be hospitalised in the next 2 years for illness or injury	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. Travel overseas in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. Have a crash, as a driver at fault in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. Have pneumonia in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6. Be able to stop quickly in an emergency while driving in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7. Be injured in a crash, as a driver at fault in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8. Be killed in a crash, as a driver at fault in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9. Have 2 consecutive years of crash-free driving	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10. Have 2 consecutive years without being booked	**1**	**2**	**3**	**4**	**5**	**6**	**7**
11. Be booked for doing an illegal U-turn in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
12. Be injured in a crash, as a driver not at fault in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
13. Be killed in a crash, as a driver not at fault in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
14. Have the car you are driving stolen in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
15. Avoid a crash nearly caused by another driver in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
16. Drive safely if driving while tired in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
17. Be booked for running a red light in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
18. Have gastrointestinal illness in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
19. Have your wallet stolen in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
20. Be injured in a crash, as a passenger in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
21. Be killed in a crash, as a passenger in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
22. Own your own home in the next 10 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
23. Be booked for driving with a blood alcohol content over the legal limit in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Please estimate the likelihood that the following events will happen to the average person of your age and gender in the future, by circling a number from 1 to 7, where the numbers mean:

1= Extremely unlikely to happen to the average person
2= Very unlikely to happen to the average person
3= Unlikely to happen to the average person
4= Neither likely nor unlikely to happen to the average person
5= Likely to happen to the average person
6= Very likely to happen to the average person
7= Extremely likely to happen to the average person

1. Be booked for speeding in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. Not be hospitalised in the next 2 years for illness or injury	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. Travel overseas in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. Have a crash, as a driver at fault in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. Have pneumonia in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6. Be able to stop quickly in an emergency while driving in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7. Be injured in a crash, as a driver at fault in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8. Be killed in a crash, as a driver at fault in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9. Have 2 consecutive years of crash-free driving	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10. Have 2 consecutive years without being booked	**1**	**2**	**3**	**4**	**5**	**6**	**7**
11. Be booked for doing an illegal U-turn in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
12. Be injured in a crash, as a driver not at fault in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
13. Be killed in a crash, as a driver not at fault in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
14. Have the car they are driving stolen in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
15. Avoid a crash nearly caused by another driver in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
16. Drive safely if driving while tired in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
17. Be booked for running a red light in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
18. Have gastrointestinal illness in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
19. Have their wallet stolen in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
20. Be injured in a crash, as a passenger in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
21. Be killed in a crash, as a passenger in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
22. Own their own home in the next 10 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**
23. Be booked for driving with a blood alcohol content over the legal limit in the next 2 years	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Please estimate how often the following events ***have happened to*** *you in the last 2 years, by writing a number in the space provided.*

1. Booked for speeding in the last 2 years	
2. Been hospitalised for illness or injury in the last 2 years	
3. Traveled overseas in the last 2 years	
4. Had a crash, as a driver at fault in the last 2 years	
5. Had pneumonia in the last 2 years	
6. Been able to stop quickly in an emergency in the last 2 years	
7. Injured in a crash, as a driver at fault in the last 2 years	
8. Had a crash in the last 2 years	
9. Been booked in the last 2 years	
10. Booked for doing an illegal U-turn in the last 2 years	
11. Injured in a crash, as a driver not at fault in the last 2 years	
12. Had car you have been driving stolen in the last 2 years	
13. Avoided a crash nearly caused by another driver in the last 2 years	
14. Drove safely while tired in the last 2 years	
15. Booked for running a red light in the last 2 years	
16. Had gastrointestinal illness in the last 2 years	
17. Had your wallet stolen in the last 2 years	
18. Injured in a crash, as a passenger in the last 2 years	
19. Booked for driving with a blood alcohol content over the legal limit in the last 2 years	

*Please estimate how often the following events **have happened to** the average person of your age and gender in the last 2 years, by writing a number in the space provided.*

1. Booked for speeding in the last 2 years	
2. Been hospitalised for illness or injury in the last 2 years	
3. Traveled overseas in the last 2 years	
4. Had a crash, as a driver at fault in the last 2 years	
5. Had pneumonia in the last 2 years	
6. Been able to stop quickly in an emergency in the last 2 years	
7. Injured in a crash, as a driver at fault in the last 2 years	
8. Had a crash in the last 2 years	
9. Been booked in the last 2 years	
10. Booked for doing an illegal U-turn in the last 2 years	
11. Injured in a crash, as a driver not at fault in the last 2 years	
12. Had car they had been driving stolen in the last 2 years	
13. Avoided a crash nearly caused by another driver in the last 2 years	
14. Drove safely while tired in the last 2 years	
15. Booked for running a red light in the last 2 years	
16. Had gastrointestinal illness in the last 2 years	
17. Had their wallet stolen in the last 2 years	
18. Injured in a crash, as a passenger in the last 2 years	
19. Booked for driving with a blood alcohol content over the legal limit in the last 2 years	

The next set of questions ask you how often you do certain actions while driving. When choosing your answer, think about your driving over the past year, and circle the number that best represents how often you do the following:

0= Never
1= Hardly ever
2= Occasionally
3= Quite often
4= Frequently
5= Nearly all the time
6= Always

1. Run a red light	**0**	**1**	**2**	**3**	**4**	**5**	**6**
2. Keep driving even though you are very tired	**0**	**1**	**2**	**3**	**4**	**5**	**6**
3. Do an illegal U-turn	**0**	**1**	**2**	**3**	**4**	**5**	**6**
4. Stop driving if you want to talk on a hand-held mobile phone	**0**	**1**	**2**	**3**	**4**	**5**	**6**
5. Change lanes without checking properly for vehicles in other lanes	**0**	**1**	**2**	**3**	**4**	**5**	**6**
6. Drive with a blood alcohol content above the legal limit	**0**	**1**	**2**	**3**	**4**	**5**	**6**
7. Drive while under the influence of illegal drugs that may impair your driving	**0**	**1**	**2**	**3**	**4**	**5**	**6**
8. Drive while under the influence of legal drugs (besides alcohol) that may impair your driving	**0**	**1**	**2**	**3**	**4**	**5**	**6**
9. Travel as a passenger of a driver with a blood alcohol content above the legal limit	**0**	**1**	**2**	**3**	**4**	**5**	**6**
10. Wear a seatbelt	**0**	**1**	**2**	**3**	**4**	**5**	**6**
11. Reduce your usual speed when it is raining	**0**	**1**	**2**	**3**	**4**	**5**	**6**
12. Turn right across a busy road even when there is a small chance of a collision	**0**	**1**	**2**	**3**	**4**	**5**	**6**
13. Exceed the speed limit by no more than 15km/hr	**0**	**1**	**2**	**3**	**4**	**5**	**6**

Please answer to the following questions about yourself.

1. How old were you at your last birthday?_____
2. Are you male or female?_____
3. What is the main language spoken at your home?_____
4. Which suburb you live in? _____
5. How long have you had your license (*Including L-plates)*?_____years _____ months
6. How many hours do you spend driving (as a driver) in an average week?_____
7. How many hours do you spend driving (as a passenger) in an average week?_____
8. Do you own your own car or have permanent access to a car owned by someone else?_____
9. How many crashes have you been in as a driver?_____

If you have ever had a crash as a driver, think of the most severe, and answer the following questions by circling "Yes" or "No":

a) Was anyone injured and hospitalised? Yes No
b) Was anyone injured and treated at the scene? Yes No
c) Was any vehicle towed away? Yes No
d) Were you at fault? Yes No
e) Was someone else at fault? Yes No
f) Were you booked? Yes No
g) Was another driver booked? Yes No
h) If you were booked, what was the charge?_____

Using the scale below as a guide, please write a number from 1 to 7 on the line to the left of each statement to indicate how much you agree with it.

1	2	3	4	5	6	7
NOT TRUE			SOMEWHAT TRUE			VERY TRUE

_____ 1. My first impressions of people usually turn out to be right.
_____ 2. It would be hard for me to break any of my bad habits.
_____ 3. I don't care to know what other people really think of me.
_____ 4. I have not always been honest with myself.
_____ 5. I always know why I like things.
_____ 6. When my emotions are aroused, it biases my thinking.
_____ 7. Once I've made up my mind, other people can seldom change my opinion.
_____ 8. I am not a safe driver when I exceed the speed limit.
9. I am fully in control of my own fate.
_____ 10. It's hard for me to shut off a disturbing thought.
_____ 11 I never regret my decisions.
_____ 12. I sometimes lose out on things because I can't make up my mind soon enough.
_____ 13. The reason I vote is because my vote can make a difference.
_____ 14. My parents were not always fair when they punished me.
_____ 15. I am a completely rational person.
_____ 16. I rarely appreciate criticism.
_____ 17. I am very confident of my judgements.
_____ 18. I have sometimes doubted my ability as a lover.
_____ 19. It's all right with me if some people happen to dislike me.
_____ 20. I don't always know the reasons why I do the things I do.
_____ 21. I sometimes tell lies if I have to.
_____ 22. I never cover up my mistakes.
_____ 23. There have been occasions when I have taken advantage of someone.
_____ 24. I never swear.
25. I sometimes try to get even rather than to forgive and forget.
_____ 26. I always obey laws, even if I'm unlikely to get caught.
_____ 27. I have said something bad about a friend behind his or her back.
_____ 28. When I hear people talking privately, I avoid listening.
_____ 29. I have received too much change from a salesperson without telling him or her
_____ 30. I always declare everything at customs.
_____ 31. When I was young I sometimes stole things.
_____ 32. I have never dropped litter in the street.
_____ 33. I sometimes drive faster than the speed limit.
_____ 34. I never read sexy books or magazines.
_____ 35. I have done things I didn't tell other people about.
_____ 36. I never take things that don't belong to me.
_____ 37. I have taken sick leave from work or school even though I wasn't really sick.
_____ 38. I have never damaged a library book or store merchandise without reporting it.
_____ 39. I have some pretty awful habits.
_____ 40. I don't gossip about other people's business.

Please ensure you have answered all questions.

How often do you think you will maintain the low risk driving behaviours you have learned in the course in the following situations:

1. When you are driving generally

0% of the time	**10%**	**20%**	**30%**	**40%**	**50% of the time**	**60%**	**70%**	**80%**	**90%**	**100% of the time**

1. When you are driving and feeling tired and not like focussing on driving

0% of the time	**10%**	**20%**	**30%**	**40%**	**50% of the time**	**60%**	**70%**	**80%**	**90%**	**100% of the time**

1. When you are driving and hurrying (e.g. because you are late)

0% of the time	**10%**	**20%**	**30%**	**40%**	**50% of the time**	**60%**	**70%**	**80%**	**90%**	**100% of the time**

It would be very helpful if you would give us permission to view your driving record. This personal information, as with all your responses to the questionnaires, will be strictly confidential, and only reported as grouped data.

Do you give us permission to view your driving record? *Please circle "Yes" or "No"*

Yes No

Please record the following personal information
Name:
Driver's license number:
Signature:

Thank you once again for your co-operation.

14 APPENDIX 4: FURTHER ANALYSIS OF DATA COLLECTED IN STUDY 2- REPLICATION OF STUDY 1 FINDINGS

14.1 STATISTICAL ANALYSIS

The raw data were analysed with SPSS (Statistical Package for the Social Sciences). The Type I error rate for all analyses was set at .05.

The relative sizes of future- versus past-related optimism bias were compared employing a repeated measures t-test.

Similarly, a repeated measures t-test was employed to compare the relative sizes of optimism bias regarding road-related versus road-unrelated events.

The hypothesis that optimism bias regarding the past contributes to optimism bias regarding the future was assessed by evaluating the correlation of relative future likelihood indices and events with corresponding relative experience indices and events. Significant positive correlations would provide evidence consistent with the hypothesis.

The relationship of optimism bias regarding future and past road use with risk-taking on the road was evaluated by assessing the correlation of relative future likelihood estimates and relative experience estimates with a general index of on-road risk-taking behaviour. The relationship of optimism bias regarding specific events (e.g. being booked for speeding) with corresponding on-road risk-taking behaviours (e.g. speeding) was also assessed.

The relationship of optimism bias regarding future and past road use with involvement in road trauma was evaluated by assessing the correlation of relative future likelihood estimates with estimates of personal experience of road trauma from the Optimism Bias Questionnaire, as well as the crash involvement item from the Demographic and Control Variables Questionnaire. For relative past experience scores only the relationship with crash involvement was assessed (due to the mathematical dependence of the personal and relative experience scales). Again, two-tailed tests were employed.

The relative sizes of correlations with on-road risk-taking and involvement in road (and other) trauma of future- versus past-related optimism bias were compared employing a Fisher's z-test.

Correlations of personal future risk estimates with on-road risk-taking and with involvement in road (and other) trauma were also computed, and their size compared to the corresponding correlations for future-related optimism bias employing a Fisher's z-test.

The proposition that on-road risk-taking contributes to road trauma is evaluated by assessing the correlation between indices of on-road risk-taking and road-trauma involvement.

Finally, we assessed the impact of demographic variables (e.g. age, gender), driving experience (e.g. number of years licensed, average hours spent driving per week) and social desirability on risk perception, risk taking and involvement in road trauma. Correlations were employed to assess the relationship between two continuous variables, whereas independent samples t-tests were employed to assess the relationship of continuous variables with dichotomous variables (e.g. gender).

14.2 RESULTS

14.2.1 Comparison Of Road-Related Versus Road-Unrelated Optimism Bias, In Relation To The Future And The Past

Relative future risk scores were significantly greater for the road-related than for the road-unrelated negative index (t_{70}=4.08, p<.001). Means were in the opposite direction for the positive indices, but did not differ significantly (t_{69}=1.12, p=.267) [see Figure 7].

Similarly, relative past experience scores were significantly greater for the road-related than for the road-unrelated negative index (t_{68}=4.50, p<.001). No significant difference was observed between the positive indices (t_{67}=1.40, p=.165), for which means were in the opposite direction [see Figure 8].

14.2.2 Comparison Of Optimism Bias Regarding The Future Versus Optimism Bias Regarding The Past

Relative past experience scores were significantly greater than relative future risk scores for the road-related negative index (t_{67}=2.04, p=.045) and for the road-unrelated indices (negative: t_{70}=2.12, p=.037; positive: t_{67}=2.75, p=.008). This difference did not reach significance for the road-related positive index (t_{68}=.39, p=.700). Past-related optimism bias was also significantly greater than future-related optimism bias for crash involvement as a driver not at fault (t_{70}=4.64, p<.001), and as a passenger (t_{71}=3.07, p=.003). This difference did not reach significance for crash involvement as a driver at fault (t_{71}=.93, p=354).

14.2.3 The Relationship Of Optimism Bias Regarding The Past With Optimism Bias Regarding The Future

Table 26 presents correlations between corresponding relative future risk and relative past experience indices.

Relative past experience scores were significantly and positively correlated with relative future risk scores for the road-related negative and positive indices, and for crash involvement as a driver not at fault, and as a passenger. For the road-unrelated negative and positive indices, and for crash involvement as a driver at fault, the correlation between future- and past-related optimism bias was positive but not significant.

Table 26: Correlations between corresponding relative future risk and relative past experience indices (with n- and p-values), in Study 2.

	r	*n*	*p*
Road-related negative index	.399	68	.001*
Road-related positive index	.331	69	.003*
Road-unrelated negative index	.016	71	.446
Road-unrelated positive index	.123	68	.160
Crash as driver at fault	.145	72	.112
Crash as driver not at fault	.224	71	.030*
Crash as passenger	.262	72	.013*

Relative past experience scores were significantly positively correlated with relative future risk scores for 4 of the 10 road-related negative events (lowest significant r=.210, n=72, p=.038), and 1 of the 3 road-related positive events (r=.377, n=69, p=.001), for which both experience and future risk were assessed. Similarly, relative past experience scores were significantly positively correlated with relative future risk scores for 3 of the 5 road-unrelated negative events (lowest significant r=.205, n=72, p=.042), and both of the 2 road-unrelated positive events (lowest significant r=.242, n=71, p=.021), for which both experience and future risk were assessed.

14.2.4 Comparison Of Scores On Other Reported Variables For Subjects Exposed To Different Instructions

Table 27 presents the main effects of instruction for all remaining variables employed in analysis. Results for on-road risk-taking and involvement in road (and other) trauma are presented in the main text.

Table 27: Main effects of instructions for the future-related versus control, and the past-related versus control, comparison, for all variables employed in later analysis, in Study 2.

Variable	*Future-related versus control*		*Past-related versus control*	
On-road risk-taking				
Total index	$F_{1,43}$=2.771	.103	$F_{1,45}$=.160	.691
Crash as a driver index	$F_{1,43}$=2.640	.111	$F_{1,45}$=.168	.684
Impairment index	$F_{1,43}$=2.210	.144	$F_{1,45}$=.573	.453
Booked index	$F_{1,43}$=4.608	.038*	$F_{1,45}$=.510	.479
Trauma involvement				
Crash as a driver index	$F_{1,43}$=.982	.327	$F_{1,45}$=.664	.419
Impairment index	$F_{1,43}$=.186	.668	$F_{1,45}$=.111	.741
Relative future risk				
Crash as a driver index	$F_{1,44}$=.034	.428	$F_{1,45}$=2.388	.129
Impairment index	$F_{1,44}$=.775	.192	$F_{1,45}$=.000	.990
Relative experience				
Crash as a driver index	$F_{1,42}$=.494	.243	$F_{1,44}$=4.258	.045*
Impairment index	$F_{1,42}$=1.217	.138	$F_{1,44}$=5.780	.020*
Personal future risk				
Road-related negative index	$F_{1,45}$=.738	.395	$F_{1,45}$=.012	.913
Road-related positive index	$F_{1,45}$=.719	.401	$F_{1,45}$=.016	.900
Road-unrelated negative index	$F_{1,45}$=.083	.774	$F_{1,45}$=.011	.915
Road-unrelated positive index	$F_{1,45}$=.057	.812	$F_{1,45}$=.099	.755
Injury as a driver at fault	$F_{1,45}$=.091	.764	$F_{1,45}$=.059	.810
Injury as a driver not at fault	$F_{1,45}$=.004	.952	$F_{1,46}$=.192	.663
Injury as a passenger	$F_{1,45}$=1.282	.264	$F_{1,46}$=1.640	.207
Crash as a driver index	$F_{1,45}$=.278	.600	$F_{1,46}$=.070	.792
Impairment index	$F_{1,45}$=.734	.396	$F_{1,46}$=.023	.881
Be booked for speeding	$F_{1,42}$=.099	.754	$F_{1,45}$=1.829	.183
Have a crash, as a driver at fault	$F_{1,41}$=.208	.651	$F_{1,45}$=.360	.551
Be injured in a crash, as a driver at	$F_{1,45}$=.331	.568	$F_{1,45}$=.162	.690

fault				
Be killed in a crash, as a driver at fault	$F_{1,45}$=.001	.982	$F_{1,45}$=.005	.9
Variable	*Future-versus*	*related control*	*Past-versus*	*related control*
Be booked for doing an illegal U-turn	$F_{1,43}$=4.927	.032*	$F_{1,45}$=2.120	.152
Be injured in a crash, as a driver not at fault	$F_{1,45}$=.012	.912	$F_{1,46}$=.034	.856
Be killed in a crash, as a driver not at fault	$F_{1,45}$=.026	.872	$F_{1,46}$=.697	.408
Be booked for running a red light	$F_{1,45}$=.626	.433	$F_{1,46}$=.125	.225
Be injured in a crash, as a passenger	$F_{1,45}$=.708	.405	$F_{1,46}$=.737	.395
Be killed in a crash, as a passenger	$F_{1,45}$=1.205	.278	$F_{1,46}$=1.844	.181
Be booked for driving with a blood alcohol content over the legal limit	$F_{1,45}$=.000	.991	$F_{1,46}$=.260	.613
Be able to stop quickly in an emergency while driving	$F_{1,45}$=.184	.670	$F_{1,45}$=.052	.820
Have 3 consecutive years of crash-free driving	$F_{1,45}$=1.560	.218	$F_{1,46}$=.024	.878
Have 3 consecutive years without being booked	$F_{1,43}$=2.918	.095	$F_{1,45}$=.204	.654
Avoid a crash nearly caused by another driver	$F_{1,45}$=.938	.338	$F_{1,46}$=.003	.959
Drive safely while tired	$F_{1,45}$=.195	.661	$F_{1,46}$=.842	.364
Have pneumonia	$F_{1,45}$=1.109	.298	$F_{1,45}$=1.243	.271
Have the car you are driving stolen	$F_{1,45}$=.802	.375	$F_{1,46}$=1.273	.265
Have gastrointestinal illness	$F_{1,45}$=1.592	.214	$F_{1,46}$=.041	.841
Have your wallet stolen	$F_{1,45}$=.147	.703	$F_{1,46}$=1.360	.250
Not be hospitalised in the next 5 years for illness or injury	$F_{1,43}$=.1.050	.311	$F_{1,46}$=2.895	.096
Travel overseas in the next 5 years	$F_{1,45}$=.760	.388	$F_{1,46}$1.359	.250
Get very good marks at university	$F_{1,45}$=.020	.887	$F_{1,46}$=.223	.639
Own your own home	$F_{1,45}$=.615	.437	$F_{1,46}$=.044	.835

Very few variables employed in later analyses demonstrated a main effect of instructions. There was only one instance in which the instructions had a significant effect on two variables whose association with each other was tested. Thus, the association between relative future risk and personal experience of "having the car you are driving stolen" was tested separately by group.

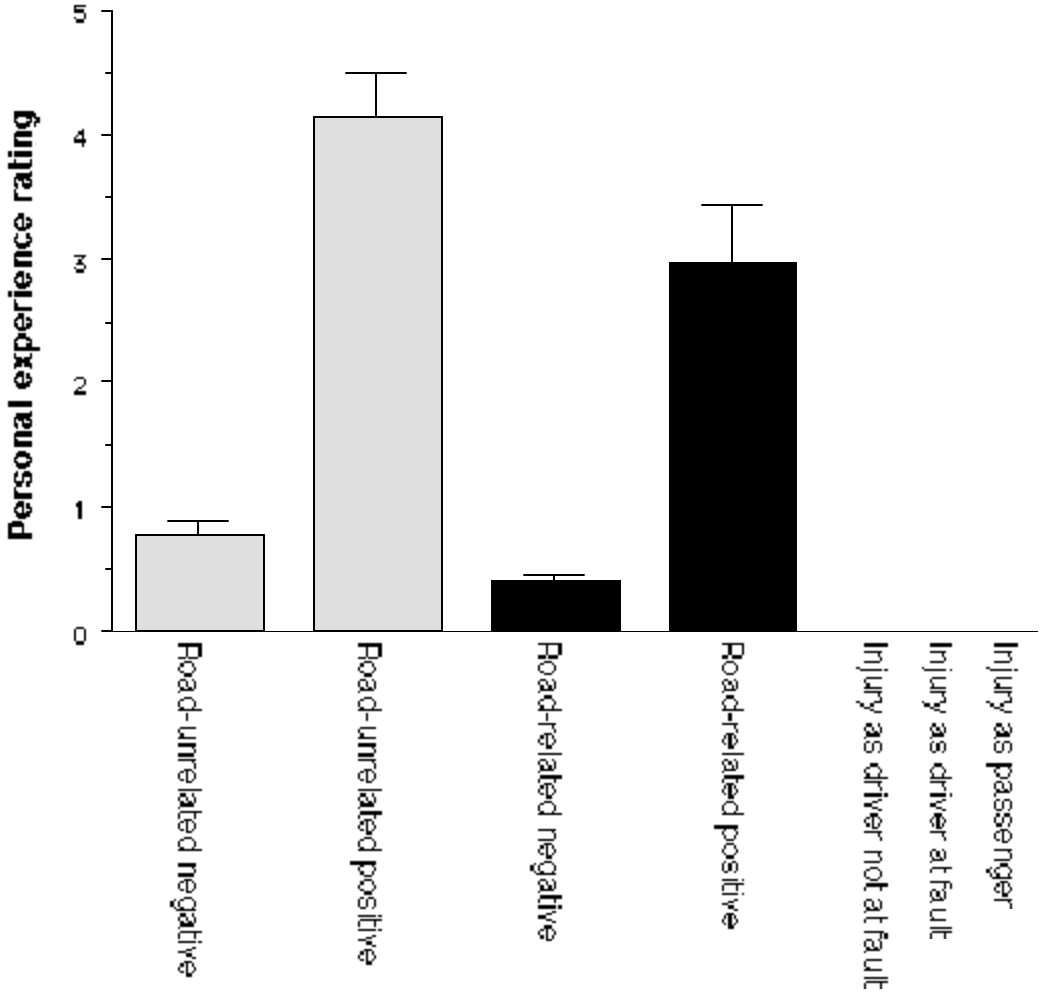
14.2.5 Mean Self-Reported Risk-Taking On The Road And Self-Reported Involvement In Road (And Other) Trauma

On average, subjects reported "never" driving under the influence of legal or illegal drugs which might impair their driving. They "frequently" reduce their usual speed when it is raining, and nearly always wear seatbelts. They reported "hardly ever" running red lights, driving with a BAC above the legal limit, or travelling as the passenger of a driver with a BAC above the legal limit. They reported

driving when tired, doing illegal U-turns, and changing lanes without checking only "occasionally". They reported "occasionally" turning right when there is a small chance of collision and stopping to talk on their mobile phone, and "quite often" exceeding the speed limit.

On average, subjects had never crashed as a driver. Figure 12 presents mean ratings for the personal experience indices

Figure 12: Mean personal experience for the road-related negative, road-related positive, road-unrelated negative and road-unrelated positive indices, and the index regarding injury/death as a driver at fault, as a driver not at fault, and as a passenger, for all participants, in Study 2.



Thus, subjects generally reported being safe drivers.

14.2.6 The Relationship Of Optimism Bias Regarding The Future With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

Table 28 presents correlations of the relative future risk indices with an average on-road risk-taking index, with corresponding personal experience indices, and with self-reported crash involvement (from the Demographic and Control Variables Questionnaire).

Table 28: Correlations of relative future risk with the on-road risk-taking index, corresponding personal past experience indices, and self-reported crash involvement (with n- and p-values), in Study 2.

	On-road risk-taking index	*Corresponding personal experience index*	*Crash involvement*
Road-related negative index	-.052 (70) .669	.146 (70) .228	-.016 (72) .896
Road-related positive index	-.162 (71) .177	.245 (72) .038*	-.055 (73) .645
Road-unrelated negative index	-.062 (70) .610	-.126 (72) .291	-.041 (72) .733
Road-unrelated positive index	.033 (68) .789	.120 (70) .322	.094 (70) .441
Crash as driver at fault	-.041 (71) .732	.066 (73) .580	-.101 (73) .396
Crash as driver not at fault	.015 (70) .902	.209 (72) .078	-.111 (72) .352
Crash as passenger	.017 (71) .888	.118 (73) .320	.072 (73) .548

No significant correlation was observed between optimism bias and on-road risk-taking.

Optimism bias correlated positively with past personal experience for road-related positive events. No further significant correlation was observed between optimism bias and involvement in road (and other) trauma.

The relationship between personal past experience and relative future risk of "have the car you are driving stolen" was assessed for each group separately, because of main effects of instruction. No significant correlation was observed amongst subjects exposed to the future-related instructions, the past-related instructions, or the control instructions (r=.043, n=23, p=.847; r=-.371, n=24, p=.075; r=.187, n=26, r=.361, respectively). Relative future risk scores were significantly positively correlated with personal experience scores for "travel overseas" (r=.244, n=72, p=.039), "be able to stop quickly in an emergency" (r=.315, n=72, p=.007. Significant negative correlations were observed for "have a crash" (r=-.262, n=73, p=.025), "be booked" (r=-.268, n=73, p=.022), and "have your wallet stolen" (r=-.285, n=73, p=.015). Thus, correlations were all in a direction

suggesting that more experience of positive events, and less experience of negative events, promotes optimism bias.

Two further road-related relative future risk indices were computed by averaging scores for 4 events which involve crashing as a driver (4, 7, 8, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &16). Corresponding on-road risk-taking indices were computed by averaging scores for behaviours which are likely to contribute to having a crash as a driver (1, 2, 3, 4, 5, 6, 7, 8, 11, 12, & 13), and by averaging scores for behaviours which contribute to impairment (2, 6, 7, & 8). Finally, an average on-road risk-taking index was computed by averaging scores for behaviours which contribute to being booked (1, 3, 6, 10, & 13).

Correlations were then computed between the corresponding road-related relative future risk and on-road risk-taking indices, and between the relative future likelihood of having 3 consecutive years of not being booked and the average index of behaviours which contribute to the likelihood of being booked. We also computed correlations of the relative future risk scores for being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The correlations of self-reported frequency of driving when tired with the relative future likelihood of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with the relative future risk of crash involvement as a passenger, were also computed. These "focussed" correlations are presented in Table 29.

Table 29: Correlations of specific road-related relative future risk indices and events, with self-reported frequency of performing corresponding on-road risk-taking behaviours (with n- and p-values), in Study 2.

	r	*n*	*p*
Crash involvement as a driver index	.063	71	.600
Impairment index	.223	73	.058
3 consecutive years without being booked	see below	see below	see below
Booked for speeding	-.270	73	.021*
Booked for doing an illegal U-turn	.113	73	.341
Booked for running a red light	.008	73	.945
Booked for driving with a BAC over the legal limit	-.322	73	.005*
Driving safely while tired	.056	73	.641
Crash involvement as a passenger	.063	73	.599

Two significant negative correlations were observed, suggesting that more frequent performance of risky on-road behaviours reduces optimism bias regarding road-related events.

The correlation between the relative future likelihood of having 3 consecutive years without being booked and behaviours which contribute to the likelihood of being booked was computed separately for each group, because of main effects of instruction. The correlation was negative but not significant for subjects given future-related instructions (r=-.405, n=23, p=.055), past-related instructions (r=-.120, n=24, p=.578) or control instructions (r=-.292, n=26, p=.148). However, given the size of the correlations, their failure to reach significance appears to reflect insufficient statistical power, due to the division of the sample.

14.2.7 The Relationship Of Optimism Bias Regarding The Past With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

Table 30 presents correlations of the relative past experience indices with an average on-road risk-taking index and with self-reported crash involvement (from the Demographic and Control Variables Questionnaire). Correlations between relative past experience indices and corresponding personal experience indices were not considered because of the mathematical dependence of these scales.

No significant correlation was observed between past-related optimism bias and on-road risk-taking or involvement in road (and other) trauma.

Two further road-related relative past experience indices were computed by averaging scores for 3 events which involve crashing as a driver (4, 7, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &14).

Table 30: Correlations of relative past experience with the on-road risk-taking index and self-reported crash involvement (with n- and p-values), in Study 2.

	On-road risk-taking index	*Crash involvement*
Road-related negative index	-.017	.084
	(67)	(69)
	.894	.492
Road-related positive index	.093	.055
	(67)	(69)
	.456	.651
Road-unrelated negative index	.085	.084
	(70)	(72)
	.483	.481
Road-unrelated positive index	.123	.004
	(69)	(71)
	.314	.977
Crash as driver at fault	.087	.180
	(70)	(72)
	.475	.129
Crash as driver not at fault	-.022	.088
	(70)	(72)
	.854	.463
Crash as passenger	.078	.190
	(70)	(72)
	.523	.110

Correlations were then computed between the corresponding road-related relative past experience and on-road risk-taking indices, and between the relative past experience of having 3 consecutive years of not being booked and the average index of behaviours which contribute to the likelihood of being booked. We also computed Correlations of the relative past experience of being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The Correlations of self-reported frequency of driving when tired with the relative past experience of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with the

relative past experience of crash involvement as a passenger, were also computed. These "focussed" Correlations are presented in Table 31.

Table 31: Correlations of specific road-related relative past experience indices and events, with self-reported frequency of performing corresponding on-road risk-taking behaviours (with n- and p-values), in Study 2.

	r	*n*	*p*
Crash involvement as a driver index	.032	70	.791
Impairment index	.062	69	.616
Been booked	.049	72	.684
Booked for speeding	-.095	72	.429
Booked for doing an illegal U-turn	.046	72	.701
Booked for running a red light	.220	72	.063
Booked for driving with a BAC over the legal limit	-.080	71	.507
Driving safely while tired	.111	72	.352
Crash involvement as a passenger	.017	72	.885

No significant correlations were observed.

14.2.8 The Relationship Of Personal Future Risk Estimates With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

Table 32 presents correlations of the personal future risk indices with an average on-road risk-taking index, with corresponding personal experience indices, and with self-reported crash involvement (from the Demographic and Control Variables Questionnaire).

Thus, personal future risk estimates correlated positively and significantly with on-road risk-taking. A significant positive correlation was also observed between past experience and future expectations of positive road-unrelated events. Personal future risk estimates of road- related positive events correlated negatively and significantly with self-reported crash involvement.

Personal future risk scores were significantly positively correlated with personal experience scores for 7 of 20 events, and significantly negatively correlated for 2 of 20 events ("had a crash", "been booked").

Two further road-related personal risk indices were computed by averaging scores for 4 events which involve crashing as a driver (4, 7, 8, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &16).

Correlations were then computed between the corresponding road-related personal future risk and on-road risk-taking indices, and between the personal future likelihood of having 3 consecutive years of not being booked and the average index of behaviours which contribute to the likelihood of being booked. We also computed correlations of the personal future risk scores for being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The correlations of self-reported frequency of driving when tired with the personal future likelihood of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with the personal future risk of crash involvement as a passenger, were also computed. These "focussed" correlations are presented in Table 33.

Table 32: Correlations of personal future risk with the on-road risk-taking index, corresponding personal past experience indices, and self-reported crash involvement (with n- and p-values), in Study 2.

	On-road risk-taking index	*Corresponding personal experience index*	*Crash involvement*
Road-related negative index	.337 (71) .004*	.056 (71) .645	.018 (73) .878
Road-related positive index	-.075 (71) .537	.276 (72) .019*	-.294 (73) .011*
Road-unrelated negative index	.097 (70) .423	.343 (72) .003*	-.093 (72) .436
Road-unrelated positive index	-.017 (71) .887	.197 (73) .095	.062 (73) .600
Crash as driver at fault	.200 (71) .095	.075 (73) .527	-.038 (73) .750
Crash as driver not at fault	.178 (71) .139	-.003 (73) .983	.019 (73) .876
Crash as passenger	.145 (71) .229	.116 (73) .330	.013 (73) .916

Table 33: Correlations of specific personal future risk indices and events, with self-reported frequency of performing corresponding on-road risk-taking behaviours (with n- and p-values), in Study 2.

	r	*n*	*p*
Crash involvement as a driver index	.331	71	.003*
Impairment index	.282	73	.008*
3 consecutive years without being booked	-.369	73	.001*
Booked for speeding	.288	73	.007*
Booked for doing an illegal U-turn	.145	73	.111
Booked for running a red light	.198	73	.047*
Booked for driving with a BAC over the legal limit	.418	73	<.001**
Driving safely while tired	.227	73	.054
Crash involvement as a passenger	.435	73	<.001**

Seven significant correlations in a direction suggesting that frequency of performing risk-relevant behaviours is associated with personal future risk estimates.

14.2.9 Comparison Of The Relationship Of Optimism Bias Regarding The Future Versus The Past With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

The correlations of the relative future risk indices with self-reported on-road risk-taking and crash involvement (from the Demographic and Control Variables Questionnaire), were compared to the Correlations of the relative past experience indices with self-reported on-road risk-taking and self-reported crash involvement. No significant differences were observed (highest nonsignificant z=1.794).

14.2.10 Comparison Of The Relationship Of Optimism Bias Regarding The Future Versus Personal Future Risk Estimates With Self-Reported Risk-Taking On The Road, And With Self-Reported Involvement In Road (And Other) Trauma

The correlations of the relative future risk indices with self-reported on-road risk-taking and crash involvement (from the Demographic and Control Variables Questionnaire), were compared to the correlations of the personal future risk indices with self-reported on-road risk-taking and self-reported crash involvement. Only one significant difference was observed, between the "focussed" correlations of "travel as a passenger of a driver with a BAC over the legal limit" and relative future risk versus relative past experience of injury/death as a passenger (z=2.384; next highest z=1.720).

14.2.11 The Relationship Of Self-Reported Risk-Taking On The Road With Self-Reported Involvement In Road (And Other) Trauma

Table 34 presents correlations of the on-road risk-taking index with personal experience indices, and with self-reported crash involvement (from the Demographic and Control Variables Questionnaire).

Table 34: Correlations of the on-road risk-taking index with personal past experience indices, and with self-reported crash involvement (with n- and p-values), in Study 2.

	r	*n*	*p*
Road-related negative index	.234	69	.027*
Road-related positive index	.222	70	ns
Road-unrelated negative index	.006	71	.481
Road-unrelated positive index	.102	71	ns
Crash as driver at fault	.045	71	.357
Crash as driver not at fault	-.074	71	ns
Crash as passenger	-.105	71	ns
Self-reported crash involvement	.257	71	.016*

ns= correlation in the direction opposite to prediction, and thus not significant according to the 1-tailed test employed.

Significant positive correlations were observed between self-reported on-road risk-taking and personal experience of road-related negative events, as well as self-reported crash involvement.

Two further road-related personal experience indices were computed by averaging scores for 3 events which involve crashing as a driver (4, 7, & 9), and by averaging scores for 2 events which are likely to be influenced by impairment (6 &14).

Correlations were then computed between corresponding on-road risk-taking and road-related personal experience indices, and between the average index of behaviours which contribute to the likelihood of being booked and the relative past experience of having 3 consecutive years of not being booked. We also computed correlations of personal experience of being booked for speeding, for doing an illegal U-turn, for running a red light, and for driving with a BAC over the legal limit, with the self-reported frequency of performing the corresponding behaviours. The correlations of self-reported frequency of driving when tired with personal experience of driving safely while tired, and of self-reported travelling with an alcohol impaired driver with personal experience of crash involvement as a passenger, were also computed. These "focussed" correlations are presented in Table 35.

Table 35: Correlations of self-reported frequency of performing corresponding on-road risk-taking behaviours with specific personal experience indices and events, and with self-reported crash involvement (with n- and p-values), in Study 2.

	r	*n*	*p*
Crash involvement as a driver index	.327	71	.003*
Impairment index	.270	71	.012*
Been booked	.211	73	.037*
Booked for speeding	.157	73	.093
Booked for doing an illegal U-turn	.042	73	.363
Booked for running a red light	.110	73	.177
Booked for driving with a BAC over the legal limit	-.041	73	ns
Driving safely while tired	.199	73	.093
Crash involvement as a passenger	.011	73	.463

ns= correlation in the direction opposite to prediction, and thus not significant according to the 1-tailed test employed.

Three significant correlations were observed in a direction suggesting that the frequency of performing risk-relevant behaviours is associated with high personal experience of negative events. Four further correlations were in this direction (but were not significant).

14.2.12 Relationship Of Demographic Variables, Driving Experience, And Social Desirability With Optimism Bias Regarding The Past And Future, On-Road Risk-Taking And Involvement In Road (And Other) Trauma.

We computed correlations of age, average number of hours spent driving each week (as a driver and as a passenger), number of years licensed, and social desirability with the relative future risk indices, the relative past experience indices, the average on-road risk-taking index, personal past experience indices and self-reported crash involvement (from the Demographic and Control Variables Questionnaire). The relationship of optimism bias, on-road risk-taking and road-trauma involvement with gender was assessed employing independent samples t-tests with gender as the grouping variable. All hypotheses were tested 2-tailed.

Optimism bias demonstrated no significant correlation with age (highest nonsignificant r=.189, n=69, p=.121). The number of hours participated reported driving (as a driver) on average per week correlated positively and significantly with the relative experience of being injured in a crash as a driver at fault or as a passenger (r=.267, n=72, p=.024, r=.262, n=72, p=.026, respectively).

Optimism bias did not correlate significantly with the number of hours participated reported driving (as a passenger) on average per week (highest nonsignificant r=-.229, n=69, p=.058) or the number of years participants reported having held their license (highest nonsignificant r=.168, n=69, p=.168). Optimism bias was not significantly associated with gender (highest nonsignificant t_{67}=1.89, p=.063) or social desirability (highest nonsignificant r=.132, n=69, p=.281).

The on-road risk-taking index correlated significantly and positively with age (r=-.164, n=87, p=.130) and social desirability (r=-.246, n=69, p=.042). There was no significant association between on-road risk-taking and gender (t_{69}=.08, p=.937), number of hours spent driving as a driver (r=.091, n=71, p=.449), number of hours spent driving as a passenger (r=-.106, n=69, p=.388), or years licensed (r=-.186, n=71, p=.120).

Personal past experience indices and self-reported crash involvement were regarded as indicators of involvement in road (and other) trauma. Self-reported crash involvement correlated significantly and positively with age (r=.266, n=73, p=.023). These indices demonstrated no further significant correlations with age (highest nonsignificant r=.200, n=73, p=.090), gender (highest nonsignificant t_{71}=1.59, p=.116), or social desirability (r=-.217, n=71, p=.069). Number of hours spent driving as a driver correlated positively and significantly with the road-related negative and positive personal past experience indices (r=.269, n=71, p=.023, r=.242, n=72, p=.041, respectively), and years licensed correlated significantly only with the road-unrelated positive index (r=.283, n=73, p=.015). and past experience of being "injured in a crash as a passenger" (r=.476, n=89, p<.001). Number of hours spent driving as a passenger did not correlate significantly with any trauma involvement. Thus, there is evidence that age and greater driving exposure is associated, unsurprisingly, with greater involvement in road-trauma.

14.3 DISCUSSION

Again, road-related optimism bias appeared to be greater than road-unrelated optimism bias. Significant differences were observed for the negative and relative future risk and experience indices.

In the present study, evidence that past-related optimism bias is greater than future-related optimism bias was stronger than in Study 1.

Evidence for a positive association between past- and future-related optimism bias was again strong, with significant correlations being observed for several indices and numerous events.

Observed relationships between relative future risk and on-road risk-taking generally suggest that less risk-taking is associated with greater optimism bias. Correlations for the main indices were consistently negative, but none was significant. Two significant negative relationships were observed for the "focussed" indices. These results are consistent with the view than risk-taking influences optimism bias rather than vice versa.

For relative experience, no significant correlations with on-road risk-taking were observed, and the directions of correlations were inconsistent, in contrast to Study 1 results.

Personal future risk estimates were again consistently related with on-road risk-taking. Positive and significant relationships were observed for negative indices and events, whereas significant negative relationships were observed for positive events. Again, these results are consistent with the view that risk-taking influences risk perception rather than vice versa.

Whilst relationships of on-road risk-taking with personal risk estimates appeared to be stronger and more consistent than with relative personal risk, this impression was not supported by statistical analyses. There was also no significant difference in the strength of relationships observed between on-road risk-taking and relative future risk versus between on-road risk-taking and relative experience.

The relationships observed between perceived risk (relative and personal) and road-trauma involvement were generally consistent with the above findings taken in conjunction with the observed significant positive relationship between on-road risk-taking and road-trauma involvement.

Relative future risk for negative events demonstrated significant negative correlations with personal experience, whereas positive correlations were observed for positive events. Self-reported crash involvement correlated significantly with only one event, as could be expected to occur by chance. These findings are consistent with the view that low past experience of negative events and high past experience of positive events contributes to optimism bias.

In contrast to Study 1 findings, no significant correlations was observed between relative experience and self-reported crash involvement.

Personal future risk estimates also demonstrated relationships with past experience, suggesting that good experiences in the past produce and expectation of good experiences in the future. One main negative index and one main positive index demonstrated significant positive correlations with personal experience ratings, and most remaining correlations were positive but not significant. Low self-reported crash involvement was significantly associated with high estimate of the chance of experiencing positive events on the road. Personal experience scores demonstrated significant positive correlations with personal future risk estimates. For self-reported crash involvement, significant positive relationships were observed for negative events, whereas significant negative relationships were observed for positive events.

The general impression that correlations were stronger and more consistent for personal than for relative future risk estimates was again not confirmed by statistical analyses. Similarly, relationships of road-trauma involvement with relative future risk versus relative past experience did not differ significantly.

Finally, age and exposure appeared to be positively associated with involvement in road (and other) trauma.