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Confidence bias, hindsight bias and perceptions of risk in motorcyclists

Abstract

Confidence bias and hindsight bias were investigated as predictors of perceived levels of risk in a sample of motorcyclists. Confidence bias was predictive of both perceived absolute risk and perceived comparative risk. Hindsight bias was predictive of total absolute risk but was only predictive of comparative risk regarding car drivers and not total comparative risk or risk compared to other motorcyclists. In addition, the direction of the relationship with risk perception differed for confidence bias compared to hindsight bias. It appears that confidence and hindsight bias operate through different processes. Personal experience of accidents was not a predictor of perceived risk, but having a friend who had an accident did have an impact.

Keywords: self-flattering, regression analysis, confidence bias, behaviour

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Rod Freeman,[1] Tony Cassidy[2]
[1]Psychology, Coventry University, UK
[2]Psychology, Ulster University, UK

Correspondence: Tony Cassidy, Psychology, Ulster University, UK, Email t.cassid@ulster.ac.uk

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Introduction

While bias in reasoning might be expected to contribute to risk taking behaviour the concept has not been very effectively utilised. Two areas of bias in meta-cognition which have received little experimental attention are, *over-confidence* or *confidence* bias and *hindsight* bias, particularly in relation to *unrealistic* perceptions of personal risk. *"People respond to hazards they perceive, if their perceptions are faulty, protection is likely to be misdirected."*[1]

Overconfidence in one's own judgement is a phenomenon that is not without some foundation, in that if you think you are more likely to be right, you probably are, i.e. subjective and objective probabilities are correlated.[3] However, it appears that subjective probabilities consistently exceed objective probabilities. Whilst confidence judgements are critical to many human activities it seems that the accuracy of our assessments are not matched by our levels of confidence. This can be demonstrated by the degree of *external correspondence* of our judgements,[4] namely the degree to which our assessments correspond to the truth of a target event or whether a target outcome occurs as we have predicted. Browne, Curley and Benson[5] refer to this process in confidence judgements as *calibration*. If an individual attaches a probability of 0.70 to a set of outcomes and in 70% of cases those assessments hold true, that individual has accurate calibration. The same holds true for assessments of target truths. In a seminal study, Fischoff, Slovic and Lichtenstein[6] found that people consistently *overestimate* when assessing the accuracy of their own knowledge base. This important study consisted of general knowledge questions each of which was accompanied by a choice of two answers, one of which was correct. Having chosen the answer they believed to be correct, participants were required to calibrate how likely it was that their answer was correct. This provided a measure of the degree of confidence that participants held in the answers they had given. The study found that there was a significant and persistent discrepancy between the number of correct answers obtained by a participant, and their level of confidence that their answers were correct. Typically participants would over-estimate, for example whilst they may have answered only 70% of questions correctly their mean confidence score that they were correct might be 85%.

Hindsight bias is another form of meta-cognitive bias that could also be known as the phenomenon of *'I knew-it-all-along'*, a self-flattering assessment of one's level of knowledge. Individuals who know a specific event outcome consistently over-estimate the probability that they would have predicted that outcome even if they had not known the result.[6–8] It appears that we may be disposed to assume that hindsight is equal to foresight. Also, additional information which is relevant to an event, is assessed as more salient if it relates directly to an event outcome which we already know. *"It appears that judgements are unconsciously biased by outcome knowledge and then subsequently justified by selective reference to supportive evidence"*.[9]

Whilst cognitive psychology has considered the errors and biases of reasoning processes, a body of research in health psychology has also been concerned with the motivations, perceptions and reasoning of individuals. The theory of planned behaviour (TPB)[10,11] and it's precursor, the theory of reasoned action (TRA)[7] provided models that account for people's behaviour based on the premise that their behavioural decisions are a result of considered processing of relevant and available information.[12] The deliberative nature of these models is resonant of the processes of deductive logic which have remained the main focus of attention for psychological research in reasoning. A significant area of debate in health psychology which predates TRA revolves around the issue of changing poor or risky health behaviours. The health belief model[13,14] has been seminal to the debate on health behaviours, what might predict health behaviours and what might explain the discrepancies between health attitudes and health behaviours.[15]

In the same way that Fischoff[6] revealed the human disposition of over-estimating the accuracy of one's own judgement, in a series of classic papers Weinstein[16–20] found that in perceptions of risk, individuals consistently underestimate their level of vulnerability, i.e. *unrealistic optimism.* Much of Weinstein's work has addressed the theoretical issues that underlie this phenomenon, with regard to the role of cognition. He argues that there is evidence that the higher an individual's belief in the probability of event, the greater the belief that the probability is higher than average for that individual. However, regarding negative events his findings suggest that the greater the individual's perceived level of control, the lower the perceived probability that the event will occur for that individual and levels of perceived probability may be attenuated to below average levels. A further cognitive bias can be demonstrated when an individual has already experienced a negative event, in this instance

the perceived probability that the event will reoccur for that individual is greater than average.[21] However, the impact of personal experience of previous negative events may not be as clear-cut as Weinstein[21] suggest. Svenson,[2] found only a weak association between previous involvement in road traffic accidents and assessments of future risk. In a study of elderly drivers, Holland[22] found no relationship between accidents experienced in the previous three years and levels of unrealistic optimism. McKenna[23] suggests that unrealistic optimism should not be the key concept in making sense of such illusory bias. He argues that it is the perceived levels of personal skill and control which will determine perceptions of vulnerability to negative events. As Harris and Middleton[24] point out, McKenna[23] makes the assumption that in cases of comparative optimism, there is a downward-comparison effect. This would parallel the findings of Perloff and Fetzer[25] in which individuals ascribed greater comparative risk to others the further they are removed (in terms of social proximity) from the participant. Whether such distorted perceptions of risk arise from unrealistic optimism or illusions of control, the downward comparison represents a form of cognitive bias.

With average distance travelled considered, motorcyclists in the UK are some six times more likely to involved in an injury accident, sixteen times more likely to be injured themselves and are more than thirty times more likely to be killed than car drivers.[26] Their study revealed that age, gender, and experience were all significant predictors of self-reported driving behaviours which breach the Law and/or Safety Rules (safe-practice), which in-turn were significant predictors of road accidents. With regard to perceptions of risk, the study also found that perceived vulnerability was a significant predictor of Law/Rule breaking behaviour. Rutter[27] longitudinal survey of motorcyclists found that as a group their estimates of comparative risk (from other motorcyclists, car drivers etc) and absolute risk (their vulnerability to being killed or injured whilst riding) demonstrated significant levels of unrealistic optimism. The study found only limited evidence that this may be attenuated by a personal history of accidents.

The present study brings together the concepts of bias in reasoning and perceptions of risk in a study of motorcyclists. In particular it considers the relationship between confidence bias, hindsight bias, and perceived risk. It is argued that bias in reasoning might add to our understanding of motivated behaviours, reasoned action and belief systems particularly with regard to risk.

The specific predictions from the study are that; 1) confidence bias and hindsight bias will predict levels of perceived risk generally, and 2) confidence bias and hindsight bias will predict levels of perceived risk compared to other road users.

Method

Design: A quasi-experimental survey design was used to explore the relationship between perceived comparative risk, perceived absolute risk, confidence bias and hindsight bias. As mental health has been shown to affect perceptions of risk[28,29] the GHQ12 measure of psychological distress was also included in the study.[30]

Participants: Participants were selected from members of the public at motorcycle events. Sixty-eight motorcyclists volunteered to take part (N=68).

Materials

Part 1: of the questionnaire entitled *'You and Your Bike'* asked for information regarding the participant and their vehicle.

Part 2: was based on previous studies involving participant's confidence assessments of their general knowledge.[5,31,32] Twenty general knowledge questions were taken from quiz books and were randomly assigned into two groups of ten questions each. One group of questions were used in this section to test for confidence bias and were presented in the form of two statements one of which participants were informed was correct. They were asked to choose which statement they believed to be correct and were then asked to assign a level of confidence to the choice they had made.

Example questions:

	The following questions in Column A contain two statements, one of which is correct and one of which is incorrect. Please tick the statement you believe is correct and then follow the instructions in Column B. **Column A**	Even if you didn't know the correct answer, you have a 50% (50/50) chance of choosing the right one. Please tick how confident you are that you have chosen the correct answer, for example; 50% = you are not at all confident, 70% = you are quite confident, 100% = you are absolutely confident. **Column B**
5	☐ Molasses is obtained from the Maple Tree ☐ Molasses is obtained from sugar-cane	50% ☐ 60% ☐ 70% ☐ 80% ☐ 90% ☐ 100% ☐

8	☐ Snowdon is the tallest mountain in Britain ☐ Ben Nevis is the tallest mountain in Britain	50% ☐ 60% ☐ 70% ☐ 80% ☐ 90% ☐ 100% ☐

The instructions explained that as one of the statements was correct, there was at least a 50% chance of choosing the right answer. Assigning this level of confidence would denote that they were not at all confident that the answer they had chosen was correct, that 70% would denote they were quite confident and 100% would denote absolute confidence.

Part 3: presented four measures of comparative risk drawn from Rutter et al.,[27] Participants were asked how likely they thought it was that they would have a road accident requiring hospital treatment in the next year compared to; car drivers, other motorcyclists, pedestrians and pedal cyclists. A five point Likert scale was used ranging from; much less likely to much more likely.

Example question:

12	How likely do you think you are to have a serious road accident (needing hospital treatment) in the next year, compared to other motorcyclists	much less likely ☐ less likely ☐ about the same ☐ more likely ☐ much more likely ☐

Two measures of absolute risk were used, also drawn from Rutter et al.,[27] Participants were asked to estimate the risk that they would be killed whilst riding their bike within the next year, they were also asked to estimate the risk that they would suffer serious injury whilst riding their bike within the year.

Example question:

15	What do you estimate is the risk that you will be killed on your bike this year	1 in 100 ☐ 1 in 500 ☐ 1 in 1000 ☐ 1 in 1500 ☐ 1 in 2000 ☐ 1 in 2500 ☐

16	What do you estimate is the risk that you will be injured on your bike this year	1 in 10 ☐ 1 in 50 ☐ 1 in 100 ☐ 1 in 150 ☐ 1 in 200 ☐ 1 in 250 ☐

Part 4: the second group of ten general knowledge questions was used to test for hindsight bias in a format based on Fischoff.[6] The participants were informed which was the correct statement but asked which option they would have chosen had the answer not been given. They were then asked to assign the level of confidence that they would have had if their answer was correct. The scale was as per part one.

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Example questions:

	The following questions in Column A also contain the correct answers to the questions. Please tick the option you would have chosen if the answer had not been given, and then follow the instructions in Column B.	Even if you hadn't known the correct answer, you had a 50% (50/50) chance of choosing the right one. Please tick how confident you would have been that the option you have just chosen was correct, for example; 50% = you are not at all confident, 70% = you are quite confident, 100% = you are absolutely confident.
	Column A	**Column B**
23	The real name of Pop Star Sting is Gordon Sumner. If you had been asked to choose between these two options, which would you have chosen? □ Andy Summers □ Gordon Sumner	50% □ 60% □ 70% □ 80% □ 90% □ 100% □

26	The potato was first bought to this country by Sir Walter Raleigh. If you had been asked to choose between these two options, which would you have chosen? □ Sir Francis Drake □ Sir Walter Raleigh.	50% □ 60% □ 70% □ 80% □ 90% □ 100% □

Part 5: comprised the 12 item General Health Questionnaire (GHQ12).[30] This is a widely used measure of general psychological distress in epidemiological surveys, and measures depression, anxiety, and somatisation.

Procedure: Each participant was assessed separately, and standardised instructions were used. They were asked to take part in a survey of *'how people make judgements'*. The participants were asked to complete the questionnaire without time restriction and were advised that they could withdraw at any time.

The measure of confidence bias was calculated in the same manner as Koriat et al.[32] A percentage score of correct answers was obtained by dividing the number of correct answers in part 2 by the total number of questions in part 2. This figure was then deducted from the mean of the confidence scores ascribed to the questions in that section and the product was taken as the measure of confidence bias.

The procedure for obtaining a measure of hindsight bias was the same as that used by Fischoff, Slovic & Lichtenstein,[6] except that theirs was a between groups design rather than the within group format of the present study. As previously stated, the present study used questions that were similar, and which had been randomly assigned from a pool of questions to part 2 or part 4 to ensure parity of item content and difficulty. The number of answers that the participants believed they would have correctly identified was divided by the number of questions in that section providing a percentage of correct responses. The percentage of correct answers that were obtained in part 2 were then deducted from this score and the product was taken as the measure of hindsight bias.

Although the measures for comparative and absolute risk were taken from Rutter et al.,[27] the scoring method for absolute risk used in the present study was modified. Rutter *et al* were concerned with measures of unrealistic optimism and the choice of probabilities provided as possible responses were based around actual probabilities of death or injury on British roads, 1 in 1500 and 1 in 100 respectively. Prediction of the correct probability was scored as zero, increments above or below that figure were scored +/- 1, 2 as appropriate. As the present study was concerned with a measure of perceived risk, the responses were scored from 1 to 6, 1 representing the lowest probability through to 6 for the highest choice of probability. The comparative risk responses were scored as per Rutter *et al*, 1 for much less likely through to 5 for much more likely.

Results

The main focus of this study was the relationship between hindsight and/or confidence bias and participant's estimates of risk, and whether this relationship was influenced by other factors including participants psychological health, experience of motorcycling, or experience of accidents.

Exploratory correlation analysis was carried out in order to examine levels of association between the variables, and this is shown in Table 1.

The results show a significant positive correlation between confidence bias and hindsight bias (r = 0.55, p = 0.001). There were significant negative correlations between confidence bias and total comparative risk (r = -0.37, p < .01) and between hindsight bias and total comparative risk (r = - 0.25, p < .05). In addition confidence bias was significantly negatively correlated with risk compared to other motorcyclists (r = 1.33, p<.01), while hindsight bias was significantly negatively correlated with risk compared to car drivers (r=-.25, p<.05). It is difficult to see why those who are overconfident tend also to see themselves at less risk compared to other motorcyclists, whereas those who are biased in hindsight see themselves at more risk compared to car drivers. There seems to be some differential peer – other group effect going on.

Neither type of bias was correlated significantly with total absolute risk, and in fact there was no significant relationship between total absolute risk and total comparative risk. It appears that while motorcyclists may perceive their risk compared to other road users as consistently higher they are less consistent in their ratings of their absolute risk. When absolute risk was divided into absolute risk of death and absolute risk of injury it is clear that the significant relationship with comparative risk is in terms of risk of injury (r = .24, p = .05) rather than risk of death. In addition risk of injury was significantly negatively correlated with confidence bias (r= -.24, p<.05). To explore the risk of injury versus risk of death more fully, both variables were categorised into under-estimators, approximately correct and over-estimators. A chi-square analysis of these categories shows that individuals were significantly more likely to overestimate their risk of death and underestimate their risk of injury (□□ = 30.92, p < .001, see Table 2).

The other interesting effect from the correlation analysis was the significant relationship between psychological distress as measured by the GHQ-12 and total comparative risk (r=.28, p<.05), risk compared to other motorcyclists (r=.24, p<.05), and risk compared to car drivers (r=.30, p<.01).

Multiple regression analysis was applied to the data to determine which dependent variables might be predicted by independent variables within the data set. Stepwise analysis revealed that confidence bias, hindsight bias and a friend having had an accident were significant predictors of levels of perceived absolute risk, accounting for 21% of variance (see Table 3). However when absolute risk was divided into risk of death and risk of injury it appears that bias is predictive of perceived risk of injury while a friend having an accident is predictive of perceived risk of death.

Psychological distress, having taken advanced training and hindsight bias predict levels of perceived risk compared to car drivers accounting for 21% of variance. The number of years of motorcycling experience, a friend having an accident and psychological distress predict risk compared to other motorcyclists accounting for 33% of variance. The final analysis was to use the categories of under-estimator, correct and over-estimator in terms of both risk of death and risk of injury to test for differences in psychological distress. This was based on the suggestion that perceptions of risk may be related to levels of optimism with over-estimators being overly optimistic. One-way anova identified a main effect for risk of death (F(2,61)=3.25,

p<.05), but no main effect for risk of injury and no interaction effect. This shows that under-estimators in terms of risk of death had a GHQ score which was significantly lower than those who approximately correctly estimated the risk. Under-estimators also scored lower than over-estimators but the difference was not significant (see Table 4).

Table 1 Spearman correlations between bias and risk

	Confidence bias	Hindsight bias	Risk/car drivers	Risk/other bikes	Risk/ cyclist	Total comparative risk	Total absolute risk	GHQ12	Age	Experience as motorcyclist	Absolute risk injury	Absolute risk death
Confidence bias	1.0	.55**	-.19	-.33**	-.18	-.37**	-.22	-.02	.22	.19	-.24*	-.07
Hindsight bias		1.0	-.25*	-.20	-.02	-.25*	.05	-.03	.18	.13	.02	.07
Risk/car drivers			1.0	.20	.41**	.51**	.02	.30*	.09	-.00	.05	-.00
Risk/other bikes				1.0	.05	.87**	.05	.24*	-.13	-.08	.21	-.12
Risk/ cyclist					1.0	.47**	.09	.12	.08	.05	.07	.08
Total comparative risk						1.0	.09	.28*	-.09	-.07	.24*	-.06
Total absolute risk							1.0	.09	-.12	-.15	.86*	.89**
GHQ12								1.0	.08	.06	.09	.07
Age									1.0	.87**	-.14	-.11
Experience motorcycling										1.0	-.13	-.12
Absolute risk injury											1.0	.53**

Table 2 Participants tendency to overestimate or underestimate risk of death

		Perceived risk of injury			Total
		Under-estimators	Correct	Over-estimators	
Perceived risk of death	Under-estimators	2	5	5	12
	Correct	0	16	3	19
	Over-estimators	23	8	4	35
	Total	25	29	12	66

Table 3 The significant predictors of risk from multiple regression analysis

Variable	Beta value	R^2	*f* value	P <	Dependent variable
Confidence bias	-0.42	0.21	4.563	0.01	Total absolute risk
Hindsight bias	0.35				
Friend had accident	0.26				
Friend had accident	-0.28	0.06	4.688	0.05	Absolute risk of death
Confidence bias	-0.49	0.14	5.518	0.01	Absolute risk of injury
Hindsight bias	0.32				
Confidence bias	-0.50	0.24	10.789	0.01	Total comparative risk
Intention to take advanced training	0.31				
Psychological distress	0.29				
Psychological distress	0.33	0.21	4.998	0.01	Comparative risk / car drivers
Taken advanced training	-0.31				
Hindsight bias	-0.27				
Years motorcycling	-0.36	0.33	9.356	0.001	Comparative risk / other motorcyclists
Friend had accident	0.37				
Psychological distress	0.29				

Table 4 Means and standard deviations on psychological distress by overestimation or underestimation of risk

	Perceived risk of death						Perceived risk of injury					
	Under-estimators		Correct		Over-estimators		Under-estimators		Correct		Over-estimators	
	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
Psychological distress	9.25	2.92	14.22	4.26	11.37	5.62	12.27	5.37	10.78	5.00	12.37	5.30

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Discussion

The predictions at the outset were that, 1) confidence bias and hindsight bias will predict levels of perceived risk generally, and 2) confidence bias and hindsight bias will predict levels of perceived risk compared to other road users. The results provide limited support for both predictions. The results of the correlation analysis demonstrate a high degree of association between confidence bias and hindsight bias indicating that those individuals who are more disposed to overestimate the accuracy of their knowledge base are also more likely to employ the self-flattering *cognitive deceit* of hindsight bias. The degree of correlation is such that one may speculate that confidence bias and hindsight bias may be components of a larger meta-cognitive phenomenon. Whilst the measures used in the present study were based upon similar general knowledge items, there is a subtle but significant difference in the processes that are invoked. The format for confidence bias questions the target individual's knowledge base and then requires a measure of confidence that their knowledge is correct. However, in the hindsight format participants are required to make a covert assessment of whether they would have known and chosen the correct answer, and then make an overt response declaring that choice and ascribing their level of confidence in that choice. The step from covert assessment to overt declaration provides a 'window of opportunity' for motivational biases to interdict the process.

Confidence bias correlates significantly with total comparative risk and with risk compared to other motorcyclists indicating that the stronger the bias the lower the perceive risk in comparison to others, in particular in comparison to other motorcyclists. Confidence bias was not significantly correlated to absolute perceived risk but was significantly correlated with perceived risk of injury indicating again that the greater the bias the lower the perceived risk. Hindsight bias was correlated with total comparative risk and risk compared to car drivers also in the direction of greater bias linked with lower perceived risk. Interestingly hindsight bias did not correlate significantly with total absolute risk or either of its component parts, risk of injury or risk of death. The relationships that appear in this data and the direction of effect support the predictions of the study and suggest that cognitive bias and risk perception are related and are likely to be parts of the same cognitive process in decision making. The fact that hindsight bias was related to perceived risk compared to car drivers while confidence bias was related to perceived risk compared to other motorcyclists is of some interest in suggesting possible different effects around some sort of group comparison process. Clearly other motorcyclists in this study would be in group or peer group members while car drivers would be out group members. It suggests that social identity processes may impact on risk perception and might provide a useful research area.

The multiple regression analysis provides further confirmation of the link between cognitive bias and risk perception thus supporting both of the study predictions. There are a number of additional outcomes from this analysis. Firstly it appears that cognitive bias does not predict perceived risk of death but strongly predicts perceived risk of injury. On the other hand having a friend who had an accident predicts perceived risk of death. This is perhaps not surprising but does suggest some difference in the decision-making process regarding risk of death compared to risk of injury.

The relationship between bias and risk differs between confidence bias and hindsight bias. Confidence bias is negatively related to both absolute and comparative risk while hindsight bias is positively related to risk perception. Individuals who consistently over estimate the accuracy of their knowledge base also underestimate the level of risk of injury or death to themselves. Those who erroneously credit themselves with a greater level of knowledge than they actually posses are also more likely to perceive higher levels of risk of injury or death.

The relationship of hindsight bias to the other variables is not what might be expected given the strong positive correlation with confidence bias. It may be helpful to compare the dynamics of the relationship between hindsight bias with the two measures of perceived risk. The model shows a positive correlation with absolute risk, however, hindsight bias was negatively associated with total comparative risk and two of the four component questions, and is a negative predictor of comparative risk compared to car drivers. The comparative risks are exactly that, comparing oneself to others and especially other road users. A self-flattering cognitive style may well pre-dispose individuals to underestimate their vulnerability compared to others. When we consider measures of absolute risk the issues are not relative or comparative to others and the psychological need for self-flattering bias is not required. Those who demonstrate the highest level of self-flattering bias are also those who acknowledge a higher level of absolute risk. If this dynamic is indeed a motivational one then it is also significant in its impact on perceptions of risk. A possible explanation may lie in the high performance and high risk nature of motorcycling. Within the culture of motorcycling, or at least the sub-culture of motorcyclists who congregate at social events from which the sample group has been drawn, higher levels of perceived absolute risk may posses a cache, an element of kudos or even machismo. Such attitudes towards personal risk may be seen positively and risk-taking perceived by some as image enhancing. Such individuals who may consider higher levels of such perceive risk as enhancing their image are also likely to be those individuals who are disposed to the self-flattery of hindsight bias. The results may add weight to the suggestion of Rutter et al.,[27] that some motorcyclists posses a strong positive *value of risk*. The study in question revealed a paradox regarding motorcyclists who knew a friend or relative who had recently been injured or killed whilst motorcycling. This negative event was positively correlated with the subsequent abandonment of safe riding behaviours. The proposition that risk has a positive value for some motorcyclists not only seems plausible but must also be considered to be highly motivational given the degree of shift in the direction of correlation between absolute and comparative risk.

The relationship between psychological distress and comparative risk may be evidence of *depressive realism*. Whilst non-depressed individuals seem predisposed to overestimate their level of control over events that may actually be uncontrollable (especially with regard to positive events), depressed people are less likely to manifest such high levels of illusion.[28,29] The net effect in terms of judgement of control is that depressed individuals may exhibit a depressive realism. This is also supported by the data in Table 4 and the related analysis which shows that those who underestimate the risk of death have lower levels of psychological distress and those whose estimates are more or less correct have the highest levels.

The negative association between having taken advanced training and perceived risk compared to car drivers may seem paradoxical as a significant element of such training is the increased awareness of the high level risks and hazards to which motorcyclists are expose.[33] However, there is an effect known as the *overconfident expert*. Fischoff[34] presented experienced professional mechanics with a fault finding tree of factors which may contribute to a motor vehicle failing to start. The study found that professional car mechanics were as insensitive as lay people to omissions of important data from the fault-finding tree and were as likely to ascribe inappropriately high levels of confidence that starting failure would not occur. Experiments

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in reasoning have consistently found that instruction or education concerning the nature of the reasoning task fails to achieve significant de-biasing of the effects of erroneous beliefs by Barston. This may account for those with advanced training demonstrating equal levels of perceived risk as those with no advanced training. However, the data suggests that such individuals actually demonstrate a greater lack of realism than their untrained counterparts. It seems probable that what McKenna[23] describes as the *illusion of control* may account for the attenuation of perceived risk. There are two inferences that can be drawn from an individual's belief that they are less at risk of being involved in a road accident than the average car driver,[35] either they are unrealistically optimistic or they consider that they are more skilful. McKenna's research with motorists indicates that it is the perceived skill levels and by consequence the higher the degree of perceived control which is responsible for the illusory bias. In the present study it is probable that those motorcyclists who have received advanced training have developed greater levels of perceived control and by consequence perceive that they are less at risk. On the other hand the intention to take advanced training is positively related to comparative risk indicating that the intention co-exists with a greater perception of risk. This suggests another link with the health psychology literature in terms of behavioural intentions, part of the theory of planned behaviour, which might be usefully investigated in relation to risk perception.[36]

Conclusion

The present study has combined measures from two separate areas of research and reveals significant evidence that cognitive bias is a predictor of certain risk perceptions. Both of the forms of cognitive bias that were examined are highly predictive of perceived absolute risk. The analysis also suggests that confidence bias and hindsight bias are quite separate processes in their impact on risk perception and their relationship to each other. This study indicates that errors which occur in cognitive reasoning affect our perceptions of the risks that surround us at a fundamental and elementary level and the area is worthy of further investigation.

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Conflicts of interest

Neither author has any conflict of interest.

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