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Optimism about safety and group-serving interpretations of safety among pedestrians and cyclists in relation to road use in general and under low light conditions

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ABSTRACT

Drivers are known to be optimistic about their risk of crash involvement, believing that they are less likely to be involved in a crash than other drivers. However, little comparative research has been conducted among other road users. In addition, optimism about crash risk is conceptualised as applying only to an individual's assessment of his or her personal risk of crash involvement. The possibility that the self-serving nature of optimism about safety might be generalised to the group-level as a cyclist or a pedestrian, i.e., becoming group-serving rather than self-serving, has been overlooked in relation to road safety. This study analysed a subset of data collected as part of a larger research project on the visibility of pedestrians, cyclists and road workers, focusing on a set of questionnaire items administered to 406 pedestrians, 838 cyclists and 622 drivers. The items related to safety in various scenarios involving drivers, pedestrians and cyclists, allowing predictions to be derived about group differences in agreement with items based on the assumption that the results would exhibit group-serving bias. Analysis of the responses indicated that specific hypotheses about group-serving interpretations of safety and responsibility were supported in 22 of the 26 comparisons. When the nine comparisons relevant to low lighting conditions were considered separately, seven were found to be supported. The findings of the research have implications for public education and for the likely acceptance of messages which are inconsistent with current assumptions and expectations of pedestrians and cyclists. They also suggest that research into group-serving interpretations of safety, even for temporary roles rather than enduring groups, could be fruitful. Further, there is an implication that gains in safety can be made by better educating road users about the limitations of their visibility and the ramifications of this for their own road safety, particularly in low light.

1. Introduction

1.1. Optimism bias and vulnerable road users

It is well-established that people tend to be optimistic about the risks they personally experience in relation to their actions, when compared with the risks other people experience when undertaking the same actions (McNaughton-Cassill and Smith, 2002; Rothman et al., 1996; Signorielli, 1990; Weinstein, 1980, 1984; Weinstein and Klein, 1996). This is sometimes termed 'optimism bias' (e.g., Weinstein and Klein, 1996). A body of research on optimism about road crash risk (as opposed to other forms of risk) has developed, primarily addressing the risk assessments of drivers rather than those of vulnerable road users such as pedestrians and cyclists (e.g., Brocas and Carillo, 2002; DeJoy, 1989; Delhomme, 1991; Job, 1999; Mesken et al., 2005; Watson et al., 1996). Some studies have focused on particular types of driver, e.g., young drivers (Fernandes et al., 2004; Harrison et al., 1999; Keating, 2007), drivers involved in rural crashes (Sticher and Sheehan, 2006), taxi drivers (Dalziel and Job, 1997a) and heavy vehicle drivers (Williamson et al., 1992). Other studies have focused on other characteristics of drivers, e.g., aging (Marottoli and Richardson, 1998; Rafaely et al., 2006), fatigue (Dalziel and Job, 1997a; Williamson et al., 1992), and drink driving (e.g., Dalziel and Job, 1997b). However there are few examples of research on optimistic assessments of risk in relation to vulnerable road users (an exception being Rutter et al., 1998 study of motorcyclists) and a lack of comparative research

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between road user types in general in terms of their optimism bias.

1.2. Self-serving bias and related concepts

While several explanations have been advanced for a personal bias towards optimism about one's safety or risk (see Chua and Job, 1999 for a list of six causal explanations), a core characteristic is that risk is interpreted in a personally favourable way, i.e., the interpretation of risk is self-serving. One definition of self-serving bias is "where an individual's preferences affect his [sic] beliefs in an optimistic direction, one favouring his own payoff. Beliefs may be about one's own ability, the environment, another player's type, or about what is a fair outcome" (Kaplan and Ruffle, 1998: p. 243). Although this definition is aimed more at studies of economic behaviour, it can be seen that the concept of optimism bias is subsumed into self-serving bias. In fact, it can be shown that optimism about one's own crash risk also overlaps conceptually with several other terms, typically used in the study of attribution, including 'benefactance' and 'egotistical attributions' (Shepperd et al., 2008). Examples in road safety research include Tronsmoen's (2008) research into self-serving assessments of driving ability in young drivers, and Stewart's (2005) application of 'defensive attribution theory' to assignment of responsibility for crashes. While the application of these various concepts goes beyond optimism bias, they all share a focus on the individual and, to the extent that they have been applied to road users, have neglected vulnerable road users such as pedestrians and cyclists.

1.3. Group-serving bias and vulnerable road users

An area that has not been explored in road safety is the degree to which such self-serving tendencies at the individual level might generalise to the collective level, e.g., do people who identify as truck drivers consider truck drivers in general (not just themselves, or other specific truck drivers) to have a lower risk of an adverse road safety event? That is, does the self-serving nature of optimism bias manifest itself at the level of group identity? This idea has already been developed in mainstream social psychology as the concept of 'group-serving', by extension from 'self-serving' (Taylor and Doria, 1981), although it is most commonly used in research into ethnicity and culture (e.g., Heine and Lehman, 1997). However no study to date has investigated group-serving biases or attributions among road users, and in particular the attributions of vulnerable road users remains unexplored. A possible reason for this gap in the research is the implicit need for group identification; being a member of a particular ethnic group is an enduring element of identity, whereas being a driver, pedestrian or cyclist is (for most people) a transient role, with many people shifting between being a driver or a pedestrian almost every day, and (for those who cycle), often between all three modes. Along the same lines, Zaccaro et al. (1987) found that higher interdependence in a group setting (in this case among athletes) increased group-serving attribution; such interdependence does not characterise road use. We were therefore interested in discovering whether group-serving bias might exist among pedestrians and cyclists. Information about self-serving biases among these groups may inform further, systematic studies of the influences of group identity and broader social constructs in determining road-users' behaviours.

1.4. Research aim

We investigated the occurrence of group-serving bias in a large sample of drivers, cyclists and pedestrians with the aim of determining whether there was evidence of group-serving interpretations. We specifically sought to determine whether people who responded as pedestrians, cyclists or drivers for the purposes of the research would tend to consider their own road user group to be at lower risk, or to have less responsibility for safety, than other road users in scenarios in which these road user groups interact.

2. Method

2.1. Participants

The data were collected as part of a larger project regarding attitudes of various road users, including their attitudes to visibility and use of high-visibility clothing (Wood et al., 2009). The sample comprised 406 pedestrians, 838 cyclists and 622 drivers who completed a questionnaire either online or in hard copy. They were recruited using relevant road user websites (e.g., cycling websites), forums dedicated to road safety, by direct approaches to road user organisations and businesses, and by distribution at university campuses. The survey was also publicised in statewide, regional and university newspapers as well as in an issue of the magazine produced by the Royal Automobile Club of Queensland (RACQ). A large majority of the surveys were completed online, and those who answered the hard copy version of the survey did not differ from those who completed the online survey in terms of age or gender or in terms of the proportion of road user types. The Queensland University of Technology human research ethics committee approved the study. All participants were provided with a full explanation of the procedures, and informed consent was obtained, with the option to withdraw from the study at any time. All responses were anonymous.

2.2. Items

A set of 22 questions asked respondents to report the extent to which they agreed or disagreed with each of a series of statements about behaviour, risk and visibility of pedestrians, cyclists, drivers and road workers, using five-point Likert scales. Some questions referred to "low light conditions (e.g., dawn, dusk or night)" while others were more general. The questionnaires for each group positioned their road user role through both the questionnaire titles (which referred respectively to the "attitudes, experiences and perceptions" of "motor vehicle drivers", "pedestrians" and "cyclists") and the preambles (which referred respectively to the beliefs of "motor vehicle drivers", "pedestrians and other recreational road user groups (e.g., walkers, runners, joggers)", and "recreational and competitive cycling groups".

2.3. Hypotheses

Items were classified according to whether endorsing the item would represent a group-serving bias on the part of one of the road user groups relative to one or both of the others, and a restricted hypothesis was generated for items which would create such a bias. We hypothesised that, for each item, the group for which there was the greatest benefit (in terms of less responsibility for safety or crashes, less potential constraints on behaviour, etc.) would tend to endorse the statement most. For example, consider item 1 "Drivers don't give cyclists enough space". It was hypothesised that drivers would tend *not* to agree with this statement, because they would be biased towards considering themselves less responsible for crashes involving cyclists, while it was hypothesised that cyclists would tend to agree because they would be biased towards attributing blame for crashes or near misses to drivers rather than to themselves; as the statement makes no reference to pedestrians, no hypothesis can validly be generated about their responses. The relativistic nature of the hypothesis in this example (as for all of the items) does not enable conjecture about the degree to which drivers

Table 1
Questionnaire items selected and relevant hypotheses generated for analysis. For all items, higher scores indicate greater agreement with the item as worded.

Questionnaire items and interpretation of group-serving responses	Hypothesis: means
1. Drivers don't give cyclists enough space	Driver < Cyclist
Drivers more likely to disagree (*resistance to blame*); *Cyclists more likely to agree* (*rationalisation of crashes/near misses*); *Pedestrians not relevant*	
2. Walkers/runners/joggers put themselves in danger by running/walking on a road	Pedestrian < Driver
Pedestrians more likely to disagree (*resistance to blame*); *Drivers more likely to agree* (*rationalisation of crashes/near misses*); *Cyclists not relevant*	
3. Walkers/runners/joggers should wear reflective clothing in low lighting conditions	Pedestrian < Driver
Same as item 2	
4. It is dangerous for people to use the road (e.g., walking/cycling/working) in low lighting conditions	Pedestrian < Driver
Pedestrians vs drivers as for item 2; Cyclists vs drivers same pattern as pedestrians vs drivers; Pedestrians vs cyclists not relevant	Cyclist < Driver
5. People using the road (e.g., walking/cycling/working) put themselves in danger by not obeying road rules (e.g., jaywalking)	Pedestrian < Driver
Same as item 4	Cyclist < Driver
6. People using the road (e.g., walking/cycling/working) don't need to wear reflective clothing in low lighting conditions if roads are well lit	Pedestrian > Driver
Pedestrians vs drivers – Pedestrians more likely to agree (*justify behaviour*); *Drivers more likely to disagree* (*rationalisation of crashes/near misses*). *Cyclists vs drivers same pattern, Pedestrians vs cyclists not relevant*	Cyclist > Driver
7. Many accidents (or near misses) are the fault of those people using the road (e.g., walking/cycling/working) in low lighting conditions	Pedestrian < Driver
Same as item 4	Cyclist < Driver
8. Cycling on roads without dedicated bicycle lanes is dangerous	Cyclist < Driver
Cyclists more likely to disagree (*resistance to blame*); *Drivers more likely to agree* (*rationalisation of crashes/near misses*); *Pedestrians not relevant*	
9. Bicycles should not be allowed on busy roads in peak hour traffic	Cyclist < Driver
Same as item 8	
10. Cyclists put themselves in danger by riding in the middle of the traffic lanes	Cyclist < Driver
Same as item 8	
11. Cyclists should wear reflective clothing in low lighting environments so they are visible	Cyclist < Driver
Same as item 8	
12. Pedestrians should wear reflective clothing in low lighting conditions so they are visible	Pedestrian < Driver
Same as item 2	
13. Cyclists don't need lights if roads are well lit	Cyclist > Driver
Cyclists more likely to agree (*rationalisation of behaviour*); *Drivers more likely to disagree* (*rationalisation of crashes/near misses*); *Pedestrians not relevant*	
14. Cyclists are difficult to see in traffic	Cyclist < Driver
Same as item 8	
15. Pedestrians are difficult to see in traffic	Pedestrian < Driver
Same as item 2	
16. Drivers do not look for cyclists	Driver < Cyclist
Same as item 1	
17. Drivers do not look for pedestrians	Driver < Pedestrian
Drivers more likely to disagree (*resistance to blame*); *Pedestrians more likely to agree* (*rationalisation of crashes/near misses*); *Cyclists not relevant*	
18. Cyclists using footpaths put pedestrians in danger	Cyclist < Pedestrian
Cyclists more likely to disagree (*resistance to blame*); *Pedestrians more likely to agree* (*rationalisation of crashes/near misses*); *Drivers not relevant*	
19. Pedestrians using cycle paths put cyclists in danger	Pedestrian < Cyclist
Pedestrians more likely to disagree (*resistance to blame*); *Cyclists more likely to agree* (*rationalisation of crashes/near misses*); *Drivers not relevant*	
20. It's OK for cyclists to ride through red lights if the road is clear	Cyclist > Driver
Cyclists more likely to agree (*rationalisation of behaviour*); *Drivers more likely to disagree* (*road rules*); *Pedestrians not relevant*	
21. Bicycles have the same road rights as other vehicles	Cyclist > Driver
Cyclists more likely to agree (*legitimation of mode*); *Drivers more likely to disagree* (*cyclists do not pay registration*); *Pedestrians not relevant*	
22. Riding in a 'pack' is safer than riding in single file	Cyclist > Driver
Cyclists more likely to agree (*safety in numbers*); *Drivers more likely to disagree* (*obstructing lanes*); *Pedestrians not relevant*	

or cyclists agree or disagree, so that the hypothesis is simply that the overall level of agreement with the statement will be lower for drivers than for cyclists, i.e., Drivers < Cyclists. Most items were relevant to only two groups; there were four items relevant to all three groups, though only to two of the three possible pairs, so that two hypotheses were generated for each of these items. Table 1 presents the 22 items and the 26 hypotheses which were tested, together with a brief summary of the rationale.

Of the 26 hypotheses, 15 concerned comparisons between drivers and cyclists, while there were nine comparing drivers and pedestrians, and two comparing cyclists and pedestrians. The larger number of comparisons involving cyclists reflects the greater range of road use scenarios relevant to cyclists.

2.4. Measures and analyses

Mean scores for each road user group were calculated and used as interval scores in comparisons between the groups. One-tailed *t*-tests were conducted for each of the comparisons. Because multiple comparisons were undertaken, a Bonferroni adjustment was made to the criterion level, resulting in a criterion *p* value of .0019 (equivalent to .05 for 26 comparisons).

3. Results

3.1. Overall results

The results of the comparisons are presented in Table 2. Of the 26 hypotheses, 22 were supported by the data, indicating group-serving responses on the part of the road users mentioned in the items. Two of the four unsupported hypotheses concerned comparison between cyclists and drivers, and two concerned comparisons between pedestrians and drivers.

3.2. Comparisons for items referring to low lighting conditions

Since a primary aim of the main research project concerns actual and perceived visibility under low lighting conditions, the items which explicitly referred to low lighting conditions were considered separately. As can be seen in Tables 1 and 2, there were nine such comparisons (four between cyclists and drivers – items 4, 6, 7 and 11, and five between pedestrians and drivers – items 3, 4, 6, 7 and 12; items mentioned twice generated two hypotheses). In seven of these comparisons the hypothesised differences were found. The two which did not exhibit a statistically significant difference comprised one cyclist–driver and one pedestrian–driver

Table 2
Results of comparisons.

	Hypothesis	Mean (SD)	*t* (df)	Support
1. Drivers don't give cyclists enough space	D < C	D 3.59 (1.14) C 4.33 (0.84)	−14.13*(1458)	Yes
2. Walkers/runners/joggers put themselves in danger by running/walking on a road	P < D	D 4.38 (0.91) P 3.88 (0.97)	−8.37* (1026)	Yes
3. Walkers/runners/joggers should wear reflective clothing in low lighting conditions	P < D	D 4.46 (0.82) P 3.82 (0.94)	−11.50*(1020)	Yes
4. It is dangerous for people to use the road (e.g., walking/cycling/working) in low lighting conditions	P < D	D 4.31 (0.87) P 3.90 (0.92)	−7.12* (1026)	Yes
	C < D	C 3.63 (1.09) D 4.31 (0.87)	−12.79*(1458)	Yes
5. People using the road (e.g., walking/cycling/working) put themselves in danger by not obeying road rules (e.g., jaywalking)	P < D	D 4.52 (0.79) P 4.20 (0.87)	−6.08* (1026)	Yes
	C < D	C 4.23 (0.91) D 4.52 (0.79)	−6.49* (1458)	Yes
6. People using the road (e.g., walking/cycling/working) don't need to wear reflective clothing in low lighting conditions if roads are well lit	P > D	D 2.15 (1.17) P 2.75 (1.08)	−8.29* (1024)	Yes
	C > D	C 2.14 (1.10) D 2.15 (1.17)	−0.15***(1456)	No
7. Many accidents (or near misses) are the fault of those people using the road (e.g., walking/cycling/working) in low lighting conditions	P < D	D 3.11 (1.05) P 2.98 (1.00)	−2.04** (1026)	No
	C < D	C 2.62 (1.09) D 3.11 (1.05)	−8.64* (1458)	Yes
8. Cycling on roads without dedicated bicycle lanes is dangerous	C < D	D 4.03 (1.03) C 3.62 (1.28)	−6.60* (1457)	Yes
9. Bicycles should not be allowed on busy roads in peak hour traffic	C < D	D 3.46 (1.40) C 1.81 (1.22)	−23.64*(1453)	Yes
10. Cyclists put themselves in danger by riding in the middle of the traffic lanes	C < D	D 4.12 (1.13) C 3.08 (1.44)	−14.87*(1453)	Yes
11. Cyclists should wear reflective clothing in low lighting environments so they are visible	C < D	D 4.70 (0.62) C 3.96 (1.09)	−15.16*(1455)	Yes
12. Pedestrians should wear reflective clothing in low lighting conditions so they are visible	P < D	D 3.99 (1.03) P 3.64 (0.99)	−5.31* (1025)	Yes
13. Cyclists don't need lights if roads are well lit	C > D	D 1.63 (1.04) C 1.42 (0.87)	−4.12***(1453)	No
14. Cyclists are difficult to see in traffic	C < D	D 3.96 (1.04) C 3.41 (1.19)	−9.21* (1453)	Yes
15. Pedestrians are difficult to see in traffic	P < D	D 3.85 (1.02) P 3.78 (0.92)	−1.15***(1023)	No
16. Drivers do not look for cyclists	D < C	D 3.48 (1.19) C 4.37 (1.85)	−16.67*(1453)	Yes
17. Drivers do not look for pedestrians	D < P	D 3.20 (1.18) P 3.82 (1.00)	−8.70* (1023)	Yes
18. Cyclists using footpaths put pedestrians in danger	C < P	P 3.88 (0.99) C 3.20 (1.28)	−9.39* (1235)	Yes
19. Pedestrians using cycle paths put cyclists in danger	P < C	P 3.48 (1.11) C 3.67 (1.13)	−2.71* (1231)	Yes
20. It's OK for cyclists to ride through red lights if the road is clear	C > D	D 1.68 (1.30) C 1.94 (1.25)	−3.85* (1455)	Yes
21. Bicycles have the same road rights as other vehicles	C > D	D 3.81 (1.31) C 4.57 (0.88)	−13.17*(1453)	Yes
22. Riding in a 'pack' is safer than riding in single file	C > D	D 2.32 (1.36) C 3.44 (1.24)	−16.30*(1454)	Yes

* $p < .0019$ in the hypothesised direction, significant after Bonferroni correction.
** $0019 < p < .05$ not significant after Bonferroni correction.
*** Not significant, or significant (two-tailed) but not in hypothesised direction.

comparison. This pattern of results is very similar to the overall pattern, suggesting that the group-serving responses were in evidence at the same level in low lighting conditions as more generally.

4. Discussion

The results provide strong support for the existence of optimism about safety and group-serving interpretations among pedestrians, cyclists and drivers. This is a surprising result which has implications for achieving safety gains for pedestrians and cyclists, given their vulnerability in a crash.

4.1. Identification with a transient group

Most individuals have high levels of experience with road systems both as a driver and as a pedestrian, given that driving and walking comprise everyday activities for most people. Even those participants who responded as a pedestrian or a cyclist in this study are also likely to drive occasionally (given that the vast majority of the adult public in Australia drive a car at least sometimes), so one would expect them to have experience of pedestrians and cyclists on the road in low lighting conditions from a driver's perspective also. From this perspective, in the current study it is the choice to respond as one of the groups which determined the dif-

ferences between people's responses. A similar phenomenon was discussed by Smyth and King (2006) in relation to driver attitudes and behaviour when driving different types of vehicle.

4.2. Public education implications of group-serving bias among pedestrians and cyclists

Group-serving bias among pedestrians, cyclists and drivers has implications for public education interventions, for example those which aim to encourage drivers to share the road with cyclists. Both drivers and cyclists would be expected to make group-serving assumptions about the relative safety of their own group and therefore the greater responsibility of the other group for the safety problems which exist. Both cyclists and drivers are likely to be resistant to the messages from the start, not just as individuals but as members of a road user group.

4.3. Opportunities for further research and elaboration

There are additional levels of complexity to assessment of risk by road users which have not been explored in the current study. For example, Andersson and Lundborg (2007) note that the assessment of risk of dying in a road crash (as opposed to simply being involved in a road crash) is underestimated by high risk groups, but overestimated by low risk groups, and that there may be interactions between age and gender in these assessments of road crash mortality risk. It would be of interest to explore whether this applies to cyclists as a high risk road user group, ahead of pedestrians who are also at a higher risk (collectively) than drivers. Our main research program includes a focus on older drivers compared with younger drivers, and the possibility of age-related differences in assessment of risk is therefore important. Stewart (2005) found that attribution of responsibility for crashes varied according to the severity of the crash, and again this was not investigated here. Furthermore, Chua and Job (1999) conducted a detailed investigation (albeit on a relatively small sample) of the possible reasons for optimism bias for a range of events including road crashes of various kinds, and concluded that optimism bias is a characteristic of the person rather than being related to the specific event. This is not consistent with the findings of the current study, where one's self-identification as a cyclist, pedestrian or driver was associated with greater optimism about events relevant to those road use modalities. A more detailed study building on Chua and Job's methodology could reveal more information about the interplay between the person, their role and the situation in relation to group-serving interpretations and optimism about safety. Additionally, some of the items included here may have lacked contextual elements that could have influenced various groups' responses. It is suggested that in future studies researchers include vignettes and descriptions of real conflict situations to help enhance our understanding of some of the views expressed here.

The pattern of group-serving interpretations was much the same for items relating to low lighting conditions as it was in general, whereas the results of our research so far (e.g., Wood et al., 2009) point to a greater mismatch between actual and perceived visibility at night than during the day. The overall scores in Table 2 do not suggest a difference within groups either (e.g., pedestrian responses to items about low lighting conditions are similar to pedestrian responses to more general items.

4.4. Relevance to ongoing research

Finally, the existence of a group-serving bias provides support for the approach taken in the larger research project, i.e., that gains in safety can be made by rendering road users safer than they realise they are. Our ongoing program of research seeks to do this by testing the benefits of biomotion (marking the moveable joints with reflective tape) for cyclists and pedestrians (Owens et al., 2007; Tyrrell et al., 2004a,b, 2009; Wood et al., 2010) and developing and testing an education intervention aimed at vulnerable road users. The intervention will demonstrate the need to be aware of difficulties drivers have in seeing pedestrians and cyclists at night time, particularly older drivers and those with visual impairment, and the utility and value of biomotion markings in relation to other clothing configurations. The findings of the current study have direct relevance to the challenges involved in developing such an intervention, as they suggest that those targeted by the education will resist its message. Tyrrell et al. (2004a) were successful in changing the perceptions of undergraduate students about their visibility at night, and the intervention planned for our future work will be based on their approach and will attempt to address the challenges of group-serving bias.

5. Conclusion

This study aimed to investigate the existence of a group-serving bias about risk and responsibility for safety among cyclists, pedestrians and drivers. The research question emerged from the results of analyses as part of a larger program of research on actual and perceived visibility of pedestrians, cyclists and road workers at night, and consequently was based on items not specifically developed to address the research question, which imposed some limitations on the research. Relevant Likert scale items (agreement on a five point scale) from a larger questionnaire answered by self-identified cyclists, pedestrians and drivers were examined. Hypotheses were developed about the patterns of responses by particular road user groups which would be expected if a group-serving bias was evident. The results supported the existence of such a bias, both overall and for scenarios under low lighting conditions. An example of such a bias is that pedestrians and cyclists show a lower level of agreement than drivers with the statement that it is dangerous for pedestrians and cyclists to use the road in low lighting conditions. One implication, borne out in other research conducted by this team, is that pedestrians and cyclists believe they are more visible at night than is indicated by the visibility responses of drivers. The main research program being undertaken by our team will attempt to address this and other issues through specially designed education approaches based on the results of our research into the enhancement of pedestrian and cyclist visibility through the use of clothing configurations incorporating reflective markers to produce the biomotion effect.

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